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Inverted Images on the Eye.

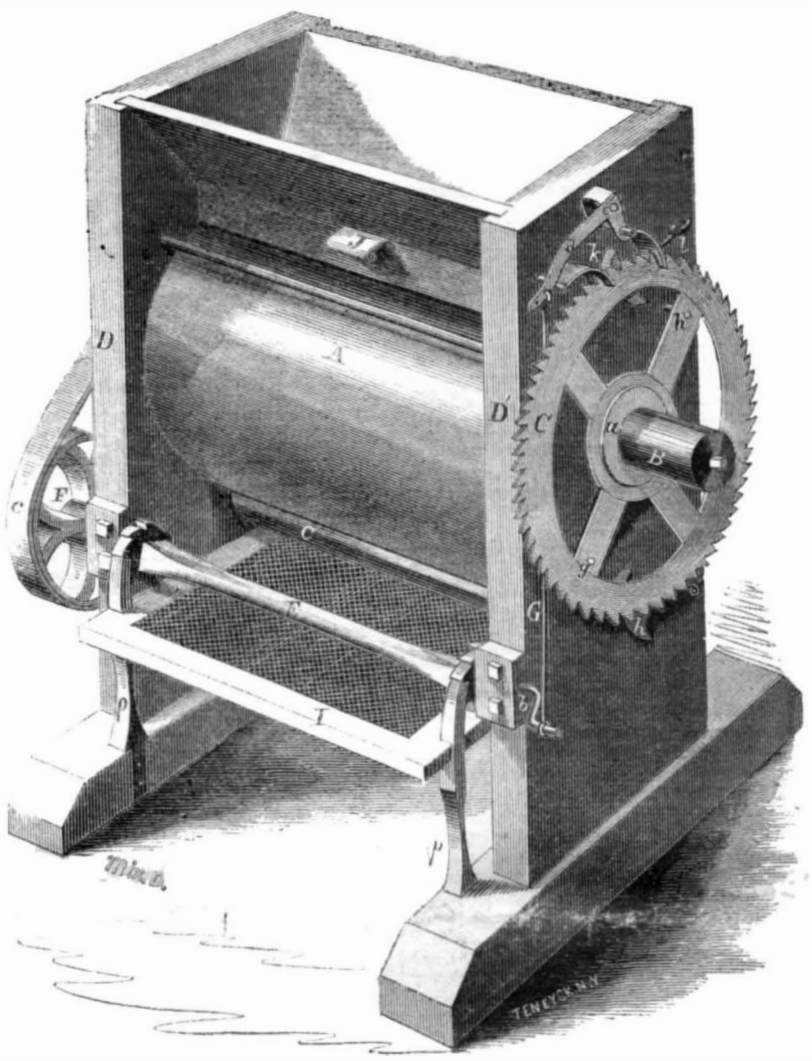
A writer in the *Journal of the Franklin Institute*, for this month, alludes to the above-named intricate question in optics, and endeavors to render it perfectly transparent, but, to our view, he utterly fails. When we look into a camera set for taking a photographic picture, we see that the image which is to be copied is turned upside down, and the pictures of all objects appear in a similar position on the retina of the eye; hence it has always been a mysterious question among philosophers, to account for the human mind appreciating them in a right position. One set of philosophers have gone so far as to assert that practice alone gives us power to discern objects correctly, and that an infant beholds them inverted until it has learned the truth by experience in handling things. If this view of the case were correct, we should be driven to the ridiculous conclusion that in viewing a clown standing on his head, we really see him standing on his feet.

The writer above referred to endeavors to explain the phenomena as follows:—"Nature has so associated impressions upon the retina with impressions on the brain, that an inverted image on the former is evidence of an erect image on the latter."

This is a mere statement of the fact, which its author mistakes for an explanation of the phenomenon. The eye must possess the mechanical property of transmitting objects in correct position to the mind, or we must accept the absurd conclusions of those philosophers who contend that the sense of vision and that of touch or feeling—as in the case of infants cited—are opposed to each other. About two years ago, Mr. S. Downs, of Newark, N. J., exhibited to us the eye of a recently slaughtered ox, to prove the existence of power in the eye to transmit images correctly to the mind. By removing a small portion of the anterior coating of the eye, and placing the page of a book close to it, then looking through from the exterior of the organ, the words appeared in correct position, and could be read with facility. This experiment affords some help to the solution of a most puzzling and controversial optical question, by presenting proof that images are resolved from an inverted position on the retina to a correct position in passing from the eye to the brain.

QUANTITY OF BLOOD IN A HORSE.—If we assume the weight of a horse to be 12 cwt., says the *American Veterinary Journal*, the whole quantity of blood will amount to 84 quarts, or 168 pounds, of which about 45 quarts, or 90 pounds, will flow from the jugular vein previous to death; although the loss of a much smaller quantity will sometimes deprive the animal of life.

FAHRNEY'S HOMINY MILL.



The manufacture of hominy is one of the regular employments of corn or grist mills; hominy itself is an article of such large consumption as to render every improvement in the contrivances for its production, of value to the community. Our illustration shows that of Ezra Fahrney, of Deep River, Iowa, who has assigned it to John Donaldson, of Mt. Morris, Ill. The invention is chiefly designed to dispense with slides for feeding and discharging hominy, and also to simplify the mechanism for operating the parts.

A is a cylinder, that has a shaft, B, placed longitudinally in it, carrrying beaters, the inside of A being also provided with corrugations of the usual construction. C is a ratchet wheel, which is placed loosely on a hub, *a*, attached to one of the two uprights, D D′, that support A. E is a shaft placed between D and D′, and having a pulley, F, at one end, and a crank pin, *b*, at the other. The belt, *c*, gives E motion from B. To the crank, *b*, a rod, G, is attached, its upper end being connected with a bent lever, *d*, that works on a fulcrum pin, *e*, attached to D′. *d* has a pawl, *f*, attached to it, that catches into the ratchet, C. On the inside of C two pins, *g h*, are attached.

On the cylinder, A, a hopper, H, is placed, provided with a door fitted in its bottom, the axle of which is attached to a rod having an arm, *k*, on its end, which is pressed by a spring, *l*, that keeps the door closed. A door or flap is also placed on the under side of A, the axle of which has an arm, *p*, on its end likewise pressed by a spring which keeps the flap closed. I is a screen, operated by the rods, *p p*, and ratchets on E. The piece, J, regulates the size of the feed hole.

The operation is as follows:—The corn is placed in the hopper, H, and motion given to the shaft, B, which by the belt, *c*, moves F and E, and the ratchet, C, by the train of motion described. Every revolution of C opens first the flap door at the top of A, and admits a certain quantity of corn to pass into the mill, and the same quantity after it is cracked and made into hominy, to fall on to the screen, I. It will be understood that the difference between the rotations of B, and the rotation of C, the former being much oftener than that of the latter, gives the corn plenty of time in the beater to be cracked, and the moment the hominy is let out, fresh corn is instantly supplied. A large hopper being provided, it does not require so much attention; and the feeding and discharging device is so simple as not to be likely to get out of order; and both operations will be steadily performed.

The invention was patented January 5th, 1858. Any further particulars can be obtained from the assignee, by addressing him as above.

Lithography.—What it is.

The engravings which appear weekly in the columns of the SCIENTIFIC AMERICAN are first drawn, and then engraved on wood, and cannot, as many seem to imagine, be lithographed. We often have letters from inventors, requesting us to lithograph and publish their machines; but lithography is not an engraving or cutting process, but simply the reproduction of a drawing. Again, a common printing press would not produce anything like an impression from a lithograph, but a modification of the copper-plate printing press needs to be used. The name is derived from two Greek words: *lithos*, a stone, and the verb *grapho*, to write.

Lithography was discovered in the year 1800, in Munich, by a German named Alois Senefelder, who, after suffering a life of poverty and deprivation, gave to the world a process by which many have made princely fortunes. The stone used is a calcareous slate, and is imported from Solen Hofen, in Germany. All limestones absorb grease or oil, more or less, and this simple fact is the base of all lithography.

To make what is called a "crayon" drawing—such as those artistic designs by Jullien, of Paris, seen in every printsellers' window—the stone is first prepared by grinding it with fine sand, and then washed clean with water. When dry, the drawing is made on the stone precisely as on paper, with (instead of a lead-pencil) a greasy crayon composed of beeswax, tallow, shellac, lampblack, &c., and, of course, is of a greasy nature. Every mark made on the stone with it, being greasy, cannot be removed unless by removing the surface of the stone with it. The drawing, when finished, is covered with a weak solution of nitric acid and gum arabic, which entirely changes the properties of the surface of the stone, so that grease will not be absorbed by it, but the solution does not affect the greasy drawing. The surface of the stone is then moistened with a sponge and water, and a fine leather roller covered with a greasy ink is passed over it; the printing ink being greasy adheres to the drawing, because the drawing is greasy, but cannot adhere anywhere else on the stone, because the stone is wet; and as water and grease will not mix, the ink sticks to the drawing only. A sheet of paper is then laid over it, and pressure of a rubbing character being applied, the paper takes up the extra ink from the original drawing, and so carries away upon its surface a perfect "proof" or printing of the illustration or design.

Portable lithographic presses can be made suitable for merchants and others, who wish to issue circulars and the like in their own handwriting, as they can write an original with a greasy ink upon paper, and then transfer it to the stone.

Air as a Stimulant.

The exciting and stimulating properties of pure oxygen are well known, and every one has felt the invigorating influence of fresh air, yet no practical application has been made of these beneficial properties of a substance so cheap and universal. When the body is weak, the brain fatigued, and the whole system in a state of lassitude, just go into the open air, take a few vigorous inspirations and expirations, and the effect will be instantly perceived. The individual trying the experiment will feel invigorated and stimulated, the blood will course with freshness, the lungs will work with increased activity, the whole frame will feel revivified, and nature's stimulant will be found the best.

Manufacturing Prospects.

The Worcester (Mass.) *Spy* states that there are decisive indications of a revival of manufacturing business in that city. Several establishments have increased the number of their mechanics, in order to fulfill the orders which they have lately received.

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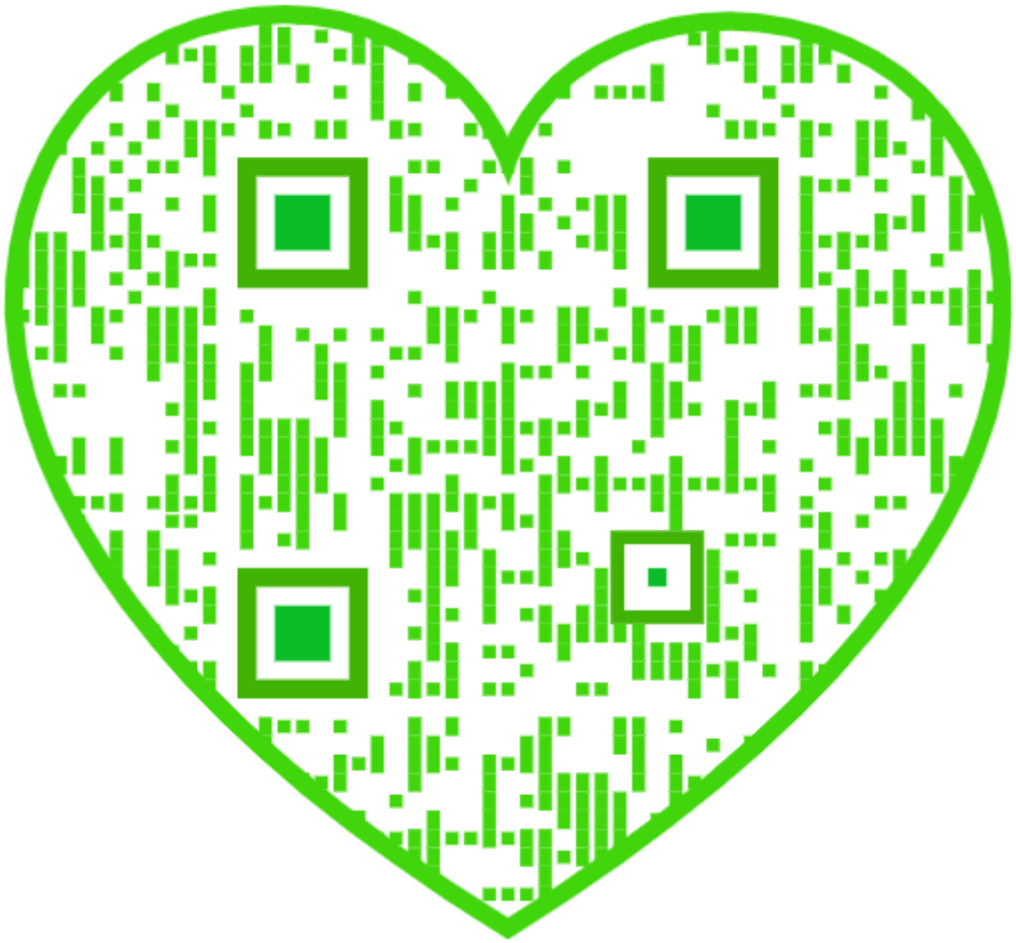

Issued from the United States Patent Office

FOR THE WEEK ENDING DECEMBER 14, 1858.

[*Reported officially for the Scientific American.*]

. Circulars giving full particulars of the mode of applying for patents, size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

STENCILS—Robert A. Adams, of St. Louis, Mo.: I claim the preparation of the "stencil" blank, in the manner described, to wit, in oil shellac and glue, applied as set forth: and I also claim the application of the sand or emery to the back of the "stencil," in the manner described, for the purpose specified.

SEWING MACHINES—J. E. Atwood, of Mansfield Centre, Conn.: I claim the combination of the vibrating arm, H, which carries the dog, g, its attached arm, K, the swinging frame, I, the independent levers, i j, the springs, h l, and the cam, J, the whole applied, arranged and operating substantially as set forth.

[This invention consists in a novel, simple and very effective combination and arrangement of feeding mechanism for moving the cloth or other material to be sewed between the successive operations of the needle.]

WRIST-BAND FASTENER—Daniel S. Baker, of Providence, R. I.: I claim the spring, E, firmly attached to the front of the fastener in its application to the heel, H, by means of a shoulder, G, and the end, J, in such manner as to form a perfect fastener, and easily operated upon substantially as set forth.

SEWING MACHINES—Amos H. Boyd, of Saco, Me.: I am aware that the looper has been revolved partially around and then back, and also that a reciprocating movement has been given to it without the employment of springs, hence I do not claim to be the first who has effected this: but I claim the combination of the looper, E, the bars, B and C, and cam wheel, D, when constructed arranged and operated in the manner substantially as described and for the purpose specified.

STOVES—John S. Clark, of Philadelphia, Pa.: I claim the movable plate, d, as it is arranged with and has relation to the grate, the usual back plate, f, the air passages, i i, and the passage for the products of combustion as set forth.

STOVES—John S. Clark and Washington Harris, of Philadelphia, Pa.: We claim, combining with the adjustable air passages at the top of the interior cylinder or lining the section of the hollow annulus, with perforations, its lower edge resting upon the inner edge of the lining and its upper edge against the shell plate, and thus forming an air chamber as set forth.

TEA AND COFFEE POTS—Stephen Culver, of Newark, N. Y.: I claim, first The leach, B, composed of the receptacle, a, the canister, b, and the tube or siphon, c, constructed and arranged substantially as described.

Second, The combination of the reservoir, D, with the leach, B, substantially in the manner and for the purposes set forth.

Third, The diaphragm, with the steam orifice, i, as specified, and the combination thereof with the receptacle of the leach in the manner and for the purpose described.

EXCAVATORS—S. S. Curtis, of Croton Corners, N. Y.: I do not claim the employment of chains and pulleys for suspending the scoop or for raising it for the purpose of transporting or tilting and discharging the same, but I claim the combination of the eccentric scoop, F, with the adjustable gage-stops and braces, K K, or their equivalents, arranged and operating substantially in the manner and for the purpose set forth.

RAILROAD BRAKE—William Edge, of Dowringtown, Pa.: I claim the application to railroad cars of a vertical self-acting safety car brake, consisting of a flanged safety block, F, cam wheel, M, axle, U, lever. N, chains, H and I, connecting rods, K, bumper, Q, wheel block, S, pedestal, E, and shafts, P, the whole combined and operated substantially as described in said specification.

AIR ENGINES—John Ericsson, of New York, N. Y.: I claim, first, The within described system of levers, rock-shafts and connecting rods, or its equivalent, for combining the supply and working pistons with the crank shaft of the engine to produce the operation specified.

Second, The ring, C4, the notches, C''', check pins, C5, and the elongation, C'', of the supply piston, or their equivalents, for effecting the required transfer of the air to and from the heater, and the cooling of the cylinder and preservation of the packing of the working piston.

Third, The telescopic tube, g, applied within the working cylinder and its prolongation, by means of which tube the air is brought in proper contact with the heating surfaces, substantially as set forth.

[This invention consists in so constructing, arranging and actuating the supply and working pistons, within a single cylinder, that the cold supply air in being transferred to the heater for the purpose of having its tension augmented, shall cool that portion of the cylinder in which the working piston moves, and keep it at so low a temperature that any kind of metal or any other suitable material, such as leather, may be employed to keep the piston air tight. In order to effect this, the working and supply pistons are connected to the crank of the fly wheel shaft by a system of levers, rockshafts and connecting rods, of such a nature that an alternating, accelerated and retarded reciprocating movement will be imparted to the two pistons, capable of effecting the desired transfer of the air and cooling of the working cylinder, and at the same time to produce motive power. The invention further consists in placing the heater within the working cylinder or a prolongation thereof, and in conveying the supply air from the cold end of the cylinder to the opposite end by such means that every particle of the air to be heated is made to traverse the entire length of the heater.]

CAR SEATS AND COUCHES—G. W. Fairfield, of Holyoke, Mass.: I claim the combination of the flexible backs, with the curved grooves, F and d, and the sliding beam G, so that the backs may be brought into a horizontal position, substantially as specified.

[By the use of a back composed of slats many advantages are secured to this car seat not found in others. The claim explains the construction.]

WATER WHEELS—John H. Fairchild, of Jericho, Vt.: I claim the single wheel, D, in combination with the draught tube, F, said wheel being placed within the penstock, A, and arranged either horizontally or vertically with said tube substantially as and for the purpose set forth.

I also claim the annular gate, H, placed within the sliding frame, G, in connection with the adjustable plate, J, arranged substantially as shown to operate as described.

[This is an improvement in a water wheel, patented by this inventor on May 11, 1858. The object of the present invention is to simplify the patented wheel without departing from the principle of its operation or in the least degree detracting from its efficacy, and at the same time regulating in a more perfect manner the supply of water to it, so that the speed of the wheel may be made uniform or constant with a varying supply of water. Patents are secure on this invention in foreign countries.]

FEED WATER AND BLOW-OFF APPARATUS FOR STEAM BOILERS—Jacob Frick, of Philadelphia, Pa.: I claim combining an air vessul, having cocks and branches, arranged substantially as herein described, with the feed and blow-off apparatus, for which letters patent of the United States were granted to me on March 18, 1856, in the manner and for the purpose specified.

COMPOSITIONS FOR TANNING LEATHER—William W. Gaige, of Rochester, N. Y.: I do not claim to have discovered any new material for tanning except what is known more or less to the trade, but I do claim to have invented the use of salt and salsoda in the proportion specified for a preparatory liquor.

I also claim the combination of starch and catechu in the proportion specified for the second or first tanning liquor.

I also claim the combination of starch, catechu and saltpeter in the proportion specified for the third liquor.

I also claim the combination of starch, catechu and alum in the proportions specified for the fourth liquor.

MACHINE FOR MAKING HOLLOW BULLETS—Richard Gornall, of Baltimore, Md.: I do not confine myself to the use of a single core, as a series of cores may be arranged on a revolving or reciprocating plate operated to carry them alternately, first into positions to combine with the dies and afterwards into proper positions relatively to a cutter or cutters to turn the bullets; nor do I confine myself to the use of a core of any particular form, nor to the manufacture of any particular form of bullet, nor to the use of any particular contrivances for giving motion to the several parts of the machine,

But I claim, first, The employment in combination with a punch and a set of dies, or their equivalent, for pressing blanks or pieces of lead into a form approximating more or less to the desired form for hollow bullets, of a revolving core, serving, firstly, to produce the cavities in the bullets, and, secondly, as a mandrel to revolve them, for the purpose of finishing their exteriors by turning them substantially as specified.

Second, The employment in combination with the revolving core of a turning cutter operating automatically, substantially as specified.

Third, The employment in combination with the revolving core and turning cutter of a female center operating substantially as described, for the purpose of securing the bullets on the core during the turning operation and liberating them after such operation.

[A punch and set of dies for pressing blanks or pieces of lead into a form like that desired, are employed in combination with a revolving core to produce the cavities in the bullets and to serve as a mandrel to revolve the bullets for the purpose of finishing their exteriors by the operation of turning. The invention also consists in the employment of an automatically operating cutter in combination with the revolving core for the purpose of turning the bullets. And it further consists in the employment in combination with the revolving core of a female center having an automatic operation for the purpose of confining the bullets upon the revolving core during the turning operation, and afterwards releasing them and moving out of the way to permit the succeeding operations of the dies.]

STEAM AND WATER ALARM GAGE FOR STEAM BOILERS—George W. Grader and Benjamin F. Cowan, of Memphis, Tenn.: We do not claim broadly the invention of a combined steam and water alarm gage, nor do we claim broadly the dispensing of a stuffing box or packing in a water gage, but we claim the combined arrangement of the two valves, F I, and their seats, the several chambers and passages, the valve levers and their connections within the case, A, substantially as described, whereby the constructions of the instrument is rendered simple, its form compact, and its size limited with the use of stuffing boxes or any packing.

[By a novel and very simple arrangement of the parts of an alarm gage for steam and water, the whole, with the exception of a float that is arranged within the boiler, and a whistle, are brought into a very compact form within a closed case of neat appearance and limited size, without the use of stuffing boxes or packing of any kind, making an instrument that can be placed in the cabin of a steam vessel, and which is beyond the control of the engineer, or other persons on board a vessel; but serves to announce to the captain or other officer and passengers whenever there is any likelihood of danger of explosion of the boiler in consequence of excessive pressure of steam or deficiency of water.]

MACHINERY FOR FORMING HAT BODIES—Michael Hardy, of New York, N. Y.: I claim combining a pervious cone, connecting with an exhausting apparatus, a picker or brush of a conical form substantially as and for the purpose specified.

I also claim in combination with the pervious cone and conical picker or brush, the apron formed and mounted substantially as described for supplying fur to the several parts of the length of the picker in proportion to the diameter as set forth.

I also claim in combination with the pervious cone and conical picker or brush substantially as described, the employment of a series of rollers forming a concave substantially as described, to direct the fur toward the cone as described.

I also claim in combination with the two cones, the one on which the bat is formed and the other fitting over the bat, the tube connected with the exhausting fan and adapted to receive and hold the outer cone substantially as described, to effect the transfer of the bat of fur fibres from the inner to the outer cone as set forth.

STEAM RADIATORS—John Henry Holt and Josiah H. Gerould, of Chicago, Ill.: What we claim is the combination of the wire gauze burner, B, and its vapor hood, D, applied to the self-acting boiler, C, above described, connected as described with the steam condensing cylinder, I, and its reservoir. J, air cocks and safety and vacuum valves and its tubes and radiators, M, with their ends open in the apartment to be heated, and all of which are particularly described and governed by the gas regulator, H, as described, which combination produces a new and improved self-acting and self-regulating apparatus for raising the temperature of any given apartment in which it may be set up by radiation from surfaces heated by condensation of steam generated by the flame of combustible gas.

HARNESS SNAPS—B. B. Hotchkiss, of Sharon, Conn.: I claim securing the spring, B, to the snap hook, A, by means of a collar, C C'', so constructed an applied as to press against the broad end as well as the faces of the spring, substantially in the manner and for the purposes set forth.

CAR BRAKES—Joseph Hough, of Buckingham, and Jacob Moore, of Bart, Pa.: We claim the arrangement and combination of the slides, F, and levers, D J, as and for the purposes shown and described.

[By a peculiar arrangement of slides and levers two shoes are made to act or press simultaneously against each wheel at opposite points of centers or axles, thereby producing more than the usual friction and also preventing the axles, when the brakes are applied, from being subjected to any strain or pressure.]

CAR SPRINGS—Charles R. Hurlburt, of Seymour, Conn.: I claim the combination of the two kinds of disks, Figs. 3 and 4, plane, and raised with the rings, Fig. 5, when the whole is constructed, combined and arranged substantially as described.

BANDAGES—N. Jensen, of Washington, D. C.: I claim forming instruments of two wire springs, a and g, the spring, g, which supports the bag, being hinged and hooked to the other spring, a, for the purposes as set forth.

FOLDING TABLE—Charles Lamurich, of New York, N. Y.: I claim the folding legs, a a, combined with and hinged on to the bed or top of the table in substantially the manner and for the purposes specified.

SLED BRAKE—Albertus Larrowe, of Cohocton, N. Y.: I claim the arrangement of lever, c, scrapers, e, and rods, f, operating as described for the purpose of a self-acting brake, and self-relieving and backing the sled as set forth.

ENGINE HOSE—Charles Lenzman, of Brooklyn, N. Y.: I claim as a new article of manufacture the hempen hose woven, saturated and covered as described.

FOLDING CHAIR—R. McG. Lytle, W. G. Alston, and Lorenzo W. True, of Williamson county, Tenn.: We claim, first, The arrangement of the arms and also of the back, substantially as described, so that the back retains the arms in place when folded.

Second, The arrangement of the legs, substantially as described, so that one set of legs folds over and retains the other set in place.

Third, The combination of the slotted bolt with the socket plate and spring stop arranged substantially as described for connecting the arms with the seats.

Fourth, In combination with the side bars we claim the screw strap, or its equivalent, for connecting the bars with the legs, so that when folded between the legs, one is raised and the other depressed for the purpose set forth.

Fifth, Connecting the legs with the seat by means of a socket joint, arranged substantially as described, so that each pair of legs can be withdrawn from their sockets and folded down without being disconnected from each other or from the seat for the purpose set forth.

SHOWER BATHS—Joseph Mansfield, of Jefferson, Wis.: I claim an improved article of manufacture: a shower bath having chambers, B C, tubes, F G H I, and stop cocks, D C, substantially as shown and described.

[Portable shower baths are very convenient and this invention is designed to extend the use of such as are not supplied with water under pressure disconnected from the apparatus, but which are supplied, as they are used with a necessary amount of water in an elevated pan or chamber, at the upper part of the device and to which the rose is directly attached. The object of this invention is to obtain, by a very simple means, a jet of water of much greater force or power than can be obtained in the ordinary portable shower baths.

BREECH-LOADING CANNON—Edward Marshall, of New York City—I claim, first, The employment of the adjustable chucks, c c, constructed, arranged and operated substantially in the manner and for the purpose set forth.

Second, I claim the recesses, E E, made from the outside of the gun into the bore, for the purpose of containing and concealing the chucks, c c, as is set forth.

Third, I claim the combination of the chucks, c c, with the pin, F, constructed substantially in the manner described.

Fourth, I claim the arrangement of the pin, F, the collar, G, and the screw, H, substantially in the manner and for the purpose specified.

Fifth, I claim the employment of projections, I, for the purpose of securing and concealing the handles of the can as is fully set forth.

CHILDREN'S CARRIAGES—Gilbert Maynard, of Greenfield, Mass.: I do not claim broadly the employment of coil springs in connection with carriages, but I claim connecting the axle, C, with the tongue, N, by means of the peculiarly formed rods, B, which also serve as springs for the vehicle as shown and described.

[This invention relates to an improvement in a mode of forming the springs of children's chairs, formerly patented by this inventor. In the former patent the springs and bearings of the wheels were formed of a single rod bent in proper shape. The present invention is designed to render springs constructed on this plan more durable without adding materially to the cost of construction.

STAIR SWEEPER—F. H. Moore, of Boston, Mass. I claim the combination of the box, B, and brush, E, with the dust pan, C, arranged and operating in the manner substantially as described, whereby the dust is prevented from escaping as set forth.

Second, And in combination with the above I claim the curtain, F, operating substantially in the manner specified.

MACHINE FOR TURNING IRREGULAR FORMS—Z. F. Nance, of Richmond, Va.: I claim passing the piece to be turned through the pattern, and the combination of the same with the swinging frame, C, and parts connected therewith, as and for the purposes set forth.

STEAM BOILERS—Charles J. C. Peterson, of Davenport, Iowa: I claim arranging the feed pipe, q, in such a manner under the fire box, that the same in combination with plates, r, placed between the bends of the feed pipe, constitutes the bottom of the ash box, so that the feed water running through the pipe, q, is heated by the ashes, said plates, r, being so arranged that they can be raised, and actuated by cranks, t, and levers, s', so as to leave room for the ashes to escape: the whole being arranged and constructed substantially as described.

[In this invention the heat from the fire is conducted through a space under that part of the boiler which contains the heating tubes before it enters them; this space is surrounded by water and is so constructed that the ashes and cinders are deposited in it at the end farthest from the fire, from which they can be drawn by a suitable opening; there is also a peculiar means for regulating the draft. The fire grate and ash box are novel; the heating tubes where they pass through the plate in the center of the boiler, usually employed to support them, are passed through short pieces of pipe, inserted in the plate, so that the jar of the engine (in case the boiler is used on a locomotive) does not injure the tubes by bringing them in contact with the sharp edges of the supporting plate.]

ADJUSTABLE CARRIAGE SEATS—Henry H. Potter, of Carthage, N. Y.: I do not confine myself to the precise arrangement shown, for various similar or equivalent plans might be devised for affecting the same result or adjustment of the seat, although perhaps the plan shown and described would be as simple and efficient as any.

I claim attaching the seat, B, to the body, A, of the vehicle substantially as shown, or in any equivalent way, so as to admit of the seat being turned obliquely with the body, either to the right or left, for the purpose set forth.

[This invention consists in having the seat of the vehicle secured to its body in such a manner that the seat may be turned obliquely with the body either to the right or left, and thereby afford greater facility than usual in getting in or out of the vehicle: also, by a proper adjustment of the seat, in a greater degree sheltering the occupants from sun or storms. The invention is applicable to seats either with or without tops, but is more especially adapted to those provided with tops, as the objections attending the use of them are entirely obviated by its adoption.]

ESCAPEMENT FOR TIME PIECES—George P. Reed, of Roxbury, Mass.: I claim the improved escapement as constructed with its two impulse cams, or a double impulse pallet, J, applied to the balance wheel axle, and to operate with the escape wheel, A, substantially as specified, in combination with the double detent, lever lifting reverse cams or pallet, P, applied to the detent lever of the escape wheel, A, and operated by a cam screw, P, or its equivalent, supporting the axle of the balance essentially as explained.

STEAM GENERATORS—Robert E. Rogers, of Philadelphia, Pa.: I claim, first, The arrangement of the coils, constructed as described, the one being concentrically within the other, the annular spaces between the successive coils constituting direct and separate and the only passages and outlets for the products of combustion, the lower portion of every coil having fire underneath it, and the whole operating as set forth.

Second, I claim the arrangement of the feed water pipe, and the air-feeding pipe in relation to each other and to the generating coils, whereby I am enabled to introduce the water in graduated quantities into the upper part of the coil, and use atmospheric air to force the water over or upon the heated surfaces as described.

Third, I claim imbedding the lower portion of each of the concentric coils in cast iron, cast around it to a greater or less hight, for the purpose of protecting the coils from high degrees of heat as set forth.

FURNACES FOR EVAPORATING SUGAR JUICES—F. Roy, of Parish of St. Bernard, La.: I do not claim broadly and of itself the open setting of kettles, but I do claim the setting of sugar kettles with the system of radial braces, i i, so situated as to divide the space around the the kettle into two apartments, communicating by the openings, o, when these upper chambers communicate with each other and by flues, X, with a common flue, g, the whole operating substantially as and for the purpose set forth.

FORCEPS FOR FASTENING CLASPS ON HOOP SKIRTS—George D. Russell, Samuel A. Russell, and Charles S. Russell, of Birmingham, Conn.: We claim the pliers having their jaws provided with recesses, b b, and lips, c c, and with a lever or wedge-like attachment B, to operate in combination with the said lips, substantially as described.

[The instrument for fastening metal clasps on hoop skirts consists of a pair of pliers whose jaws are provided with recesses and lips, and with a lever or wedge-like attachment operating in combination with the lips to close the ears of the clasp upon the hoop.]

BEE HIVES—Joseph D. Sanderson, of Stetson, Maine: I do not claim the employment or use of space honey boxes placed around a hive and communicating with it, for these have been previously used.

Neither do I claim, broadly, ventilating the hive by having a current of air passing vertically through it by means of apertures or openings at the top and bottom, for this has been previously done.

Nor do I claim the perforated horizontal tubes, I I, nor the box, J.

But I claim the holes, h, in the back of the hive, communicating with the grooves, i, in the doors, E E, and the grooves, j, in the under side of the top, F, of the box, A, in connection with the boxes, G, provided with perforated plates, K, whereby the hive is perfectly ventilated, and the rain excluded.

[In this invention a novel means is employed for facilitating the passage of the bees from one portion of the hive to another, and also a peculiar method of ventilating the hive is adopted. There is also a device for protecting the entrance of the hive, so that the bees may, when necessary, be fed without danger of being robbed by the bees of adjoining hives.]

GAS-BURNING STOVES—Thomas Shaw (assignor to himself and C. S. Patterson), of Philadelphia, Pa.: I claim, first, The inverted cone, c, when arranged within and in respect to the hollow cylinder, A, and connected to the gas pipe, B, substantially as and for the purpose set forth.

Second, Extending the gauze disk, e, beyond the opening for the passage of the gas, and so arranging the overhanging portion of the said disk that it shall be exposed to the air, as set forth and for the purpose specified.

Third, The construction of the oven, consisting of the inverted box, D, its opening, q, and lining, E, and the inner cylinder, k, the whole being arranged to form the intervening passages, m n, and p, for the purpose set forth.

HARVESTERS—Oren Stoddard, of Busti, N. Y.: I am aware that friction rollers have been applied to the finger bars of harvesters in order to diminish the friction attending the operation of the sickle, but so far as I am aware, for this purpose only.

I am also aware that levers arranged similarly to those shown and described for regulating the hight of the sickle, have been previously used. I therefore do not claim, broadly, the application of friction rollers to a finger bar and sickle, when viewed merely as such, irrespective of the other function described.

Neither do I claim the levers, N O, for raising and lowering the finger bar and sickle.

But I claim the conical rollers, G G, two or more attached to the finger bar, c, in connection with the sickle bar, b, provided with an inclined back, and the cap plate, H, or its equivalent, the whole being arranged to operate substantially as and for the purpose set forth.

[This invention consists in the employment or use of conical rollers attached to the finger bar, and used in connection with a sickle bar having a beveled back, and also used in connection with a cap plate, the whole being arranged so that the points or front parts of the sickle teeth are made, by the action of the grass or grain being cut, or by the resistance offered by the grass or grain to the forward movement of the machine, to bind or bear snugly on the front parts of the fingers, and thereby greatly add to the efficiency of the cutting device. The invention also consists in a peculiar means employed for attaching a draft pole or shaft to the machine, whereby either may, with the greatest facility, be attached and detached from one and the same machine, as occasion may require. This is an excellent machine for one or two horses; strong and complete.]

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NUT MACHINES—Julius B. Savage, of Southington, Conn. : I claim the employment or use of the cutter, E, dies, L M F, and punch, G, in connection with the conveyors adjusters, j k l m n, and the jaws, P Q, or their equivalents, the whole being arranged and combined to operate as and for the purpose set forth.

[A cutting device, dies, punch, and a series of adjusters and conveyors, arranged so that the blanks are cut off from the bar properly compressed or formed, and punched ready for the tap—the several parts working automatically—are employed in this invention.]

WATER GAGES FOR STEAM BOILERS—Thos. Stubblefield, of Columbus, Ga. : I claim the combination of a float, a secondary valve, and a main valve, substantially as set forth.

I also claim the method of preventing a too sudden opening of the main valve by insulating (in a chamber or its outer side, exposed to the air) a quantity of steam, substantially as set forth.

ATTACHING CARRIAGE THILLS TO AXLES—John W. Sibbet, of Cincinnati, Ohio : I claim the plate, C, and socket or tube, D, attached to the clip, B, in connection with the pin, G, attached to the thill, F, and the hook, H, provided with a shank, I, and nut, J, and ratchet, K, the shank of the hook being fitted in the tube, D, and the ratchet having a pawl, I, catching into or engaged with it, the whole being arranged substantially as and for the purpose set forth.

[The shanks of hooks which encompass pins attached to the inner ends of the thills, pass through sockets attached transversely to clips that encompass the axle. The ends of the shanks of the hooks have screw threads formed on them, on which nuts are fitted, the nuts being attached to ratchets, into which pawls secured to the back side of the clips catch, and prevent the casual turning and unscrewing of the nuts. The invention is designed to effectually obviate the rattling and play occasioned by the wear of the parts forming the connection or attachment, by affording a very facile way of taking up the wear or adjusting the connecting hooks.]

FLUID METERS—Charles Wm. Siemens, of London, England. Patented in England March 4th, 1853 : I claim, first, The construction of rotary fluid meters with a revolving wheel or drum, having tangential or oblique apertures, and connected with a counter, and inclosed in a fluid-tight case, and so arranged that the fluid to be measured flows from the center towards the circumference of the wheel or drum, substantially in manner described.

Second, The application to rotary fluid meters of retarding vanes, substantially in manner and for the purpose described.

Third, Constructing the revolving part or wheel of a fluid meter and the fixed part or pipe which introduces the fluid into it, with two or more collars or flanges on one or both of the said parts, so as to check the passage of the fluid by the producing of eddies, substantially in manner described.

Fourth, Supporting the wheels or revolving parts of fluid meters by means of a flat or hollow plate or cap of steel, or other suitable material, attached to the wheel, and resting upon a pixed pivot, and combined with an oil chamber, substantially as described.

Fifth, Constructing fluid meters with a revolving wheel or drum having tangential or oblique apertures and retarding vanes, and provided with an oil chamber and pivot, and connected to a counter and inclosed in a fluid-tight case, substantially as described.

Sixth, Constructing fluid meters with a dirt box or strainer, arranged so that it may be opened and the dirt removed without disturbing the meter or the pipes, substantially as described with reference to figures.

Seventh, Constructing fluid meters with the wheel work or a portion of the wheel work of the counter inclosed in an oil chamber which is exposed to the pressure of the fluid in the meter, substantially as described.

CULTIVATORS—Thomas Turner, of Marysville, Ohio : I do not claim a double plow.

Nor do I claim two mold boards attached to beams rendered capable of a lateral adjustment, for expanding plows and cultivators have been previously used.

But I claim the combination of the pulverizing mold board, F, and hilling mold board, G, constructed as shown, and attached respectively to the longitudinally and laterally adjustable beams, A B, the whole being arranged substantially as and for the purpose set forth.

[In this invention two mold boards are employed, placed one in advance of the other, and attached to separate beams, connected together so as to be capable of adjustment, the front mold board being of crescent form, so as to allow the earth raised by it to pass over its share into the furrow, and directly in front of the other mold board, which casts it up in a pulverized state towards the crop under cultivation. The object of the invention is to work the earth thoroughly, or pulverize it before casting it up against the plants, and thereby render the implement much more efficient than the usual single plow.]

ADJUSTABLE CRADLE FOR DRY DOCKS AND MARINE RAILWAYS—Washington Van Dusen, of Philadelphia, Pa. : I claim the combination and arrangement of the cradle bars, I R, jointed, connecting and sliding bars, M N R', chains, H H', and sliding lifting screw blocks F, respectively connected together, and to the cradles frames, B, or ribs, E, in such manner and in such relation to each other as to enable the cradle bars, I R, to be adjusted to the bilge of the vessel desired to be hauled up and to sustain the same by operating the lifting screws, F, on one side of the cradle frames, B, substantially as described.

[This invention relates to the cradles of marine railways, and consists in so constructing the cradle bars and arranging the same in relation to each other, and attaching them by bars and chains to sliding blocks attached to the lower ends of vertical screw shafts arranged together on one side of the cradle, that the sliding blocks and cradle bars can be raised and lowered so as to properly adjust the latter to the bottom of the vessel they are intended to sustain, by the turning of the screws on one side of the vessel.]

SLIDE VALVE GEAR OF STEAM ENGINES—Elijah Ware, of South Boston, Mass. : I claim the combination of the single eccentric having a short eccentric rod, D, the fulcrum plates, E G, carrying a fulcrum pin, b, having a connection with the short eccentric rod, the slotted frame, H, receiving the fulcrum pin and a pin on the eccentric rod and the slotted plate, J, receiving a pin, e, or its equivalent, attached to a rod connected with the valve, the whole being applied to operate substantially as set forth.

[This invention consists in a certain combination of mechanical devices for effecting the connection between the slide valve and an eccentric on the crank shaft, whereby a single eccentric fastened permanently upon the shaft is made to operate one valve, to run an engine in either direction, and to give different lengths of stroke and different degrees of lead to the valve, to effect the regulation of the engine, thus performing with one eccentric what in a locomotive with ordinary valve gear requires three eccentrics to each cylinder.]

LOCK—Charles S. Westcott, of New York City : I am aware that revolving slotted wheels have been heretofore used, and therefore distinctly disclaim the invention of the same.

I also disclaim the invention of the direct entering of a shoulder or attachment to the bolt into the slotted wheels.

But I claim the ungearing of two sets of wheels when a lock is unlocked, in such a manner as to allow the slotted wheels which receive the tongue of the bolt to remain stationary while the remaining wheels can be turned to any desired position, so that the combination can be changed through the key-hole from the front of the lock, said ungearing being effected by means of a bar, K, or its equivalent, acting upon a movable piece of metal which supports the shaft upon which one set of wheels revolve, said bar being moved by the action of throwing the bolt, so as to throw one set of wheels out of gear with the slotted wheels when the lock is unlocked, and bring them into gear again when it is locked.

APPARATUS FOR OPERATING VALVES OF STEAM ENGINES—Norman W. Wheeler, of Brooklyn, N. Y. : I claim actuating the cut-off valves of steam engines by means of an eccentric, or its equivalent, when the motion of the main valve is derived from the same eccentric, or its equivalent, but modified by a movement derived directly from a reciprocating part, substantially as described.

VALVE GEAR OF STEAM ENGINES—John L. Whetstone, of Cincinnati, Ohio : I do not wish to be understood as limiting myself to the precise arrangement or combination of parts, as described, but will vary them as circumstances may require, while at the same time I accomplish the same ends by means substantially the same, as, for instance, a sliding plate valve or a piston valve may be used instead of the rotating valve herewith shown, and in that case, if preferred, a forked arm may be attached to the rod which operates the cut-off valve, and the adjustable radius bar may be operated in the forked opening so as to give the cut-off valve a similar varying intermittent motion as that described. Or the arrangement of the parts may be reversed, as, for instance, placing the forked lever or arm on the rod or rock shaft which operates the main valve of the engine, and communicating motion to the cut-off valve therefrom through an adjustable radius bar similar to that described ; and if desired, the governor may be made to operate the cut-off and throttle adjustments by a direct attachment of rods and levers to the rotating disk or an equivalent device, without the worm wheel arrangement.

I claim, first, Operating the cut-off valve by means of a forked arm or lever, O, which is actuated by means of an adjustable radius bar, K, which derives its motion from the rock shaft or from the eccentric which operates the main valves of the engine, the whole being arranged substantially as described.

Second, Adjusting the radius bar, K, by the variations of the speed of the governor, by means of a rotating disk operated by a worm wheel, R, said worm wheel being in such relation to the governor that when the governor is running at its right speed, no motion is communicated to the same, but when the governor runs either too fast or too slow, the worm wheel is turned in one direction or the other, and the radius bar, K, is raised or lowered so that the cut-off is effected sooner or later, the whole being arranged and constructed substantially as described.

Third, Operating the throttle and cut-off valve adjustments in combination, in such manner that the throttle valve is moved slowly, and is not closed to any considerable extent, while at the same time the cut-off adjustment is moved rapidly, and on the other hand, when the cut-off adjustment is in position for the shortest period of admission of steam, the movements of the throttle valve are the most rapid, the whole being accomplished in the manner substantially as described.

[This is a valuable improvement in valves, the nature of which will be clearly seen from a perusal of the claim.]

VALVES OF STEAM ENGINES—H. D. Wicks, of Flint, Mich. : I am aware that it is not new to have a valve constructed so as to serve as a steam chest.

But I am not aware that the steam has been admitted to such valves in any other manner than from above the ports, which mode of admitting the steam subjects the valve, while operating, to a downward pressure, that causes it to bind on its seat, whereas, by admitting the steam from below the ports, the valve is subjected to an upward pressure, and thus is relieved from bind and wear while operating.

I do not claim, broadly, so making a valve that it shall perform the office of a steam chest.

But I claim the valve, B, having the ports and cavities, f f' h c, and suspended between screws, j j, in combination with valve seat, a a, having the cavity or port, b, substantially as and for the purposes set forth.

[This invention consists in a certain arrangement of steam passages in the valve and seat, whereby the steam chest is dispensed with, or in other words, the valve is made to serve as the steam chest, and hence the construction of the engine is simplified, and the steam made to act on the valve in such a way that all unnecessary pressure of the valve upon its seat is obviated.]

MACHINE FOR DRILLING METALS—Robert Wilson, of Milton, Pa. : I do not claim the self-feeding of a hand or power-drilling machine by a ratchet wheel having a feed hand worked by an involute or scroll on the driving shaft.

Nor do I claim a self-feeding and self-reacting drilling machine, for these principles were in use before my application.

Nor do I claim anything in a table on which to lay the metal to be operated upon ; therefore I do not describe or show a table at all, using any of the known forms which may best suit the work to be laid thereon.

But I claim, first, the adjustable inclined plane, for the purpose of increasing and decreasing the feed of a hand or power-drilling machine for all kinds of metal.

Second, I claim the peculiar construction of the self-acting feed escapement combined with the adjustable inclined plane, for the purpose of throwing off and on the feed to suit any depth of hole within its entire descent, and then return again only to the hight required within its ascent.

Third, I claim the adjustable bearing against which the lower end of the feed hand rests, in combination with the involute or scroll, and the feed hand which works upon it, for the purpose of producing a safety adjustable self-acting pressure escapement, all substantially in the manner and for the purpose set forth.

FIRE ESCAPE LADDER—John Withers, of Collinsville, Ill. : I claim, first, The combination of the canvas bag or shoot, K, with the ladder, A, in the manner described, for the purpose specified.

Second, The combination of a bed, J, and its frame as shown and described arranged to open and close, as set forth.

Third, The arrangement of the two ladders, A and B, with each other, in the manner set forth, and also the means of adjusting the ladder, B, substantially in the manner described.

BREECH-LOADING CANNON—Edward S. Wright and Theodore P. Gould, of Buffalo, N. Y. : First, We claim a mortise made through the breech of a cannon, in combination with the sliding abutment, D, for the purposes and substantially as set forth.

Second, We claim the expansive chamber, H, or its equivalent, in combination with the cannon, A, and sliding abutment, D, for the purposes and substantially as described.

Third, We claim the application of a wrought iron band shrunk around the breech of a cannon, when the same is combined with a mortise and sliding abutment, as set forth.

MACHINES FOR CUTTING SOAP—Wm. B. Manning (assignor to himself and L. H. Olmsted), of Owego, N. Y. : I claim the machine described for converting block and slab soap into bars and cakes consisting substantially of the frame or series of cutters, the guiding and supporting bars, and the presser or follower.

RAKING ATTACHMENTS TO HARVESTERS — Joseph Young, of Marshallton, Pa. : I am aware that rakes vibrating or moving in the arc of a circle, have been previously used, and I therefore do not claim, broadly, such device.

I claim the arrangement of the rake bar, H, shaft, G, rod, j, provided with friction roller, l, jointed connecting rods, F N, attached to crank pulley, e, inclined adjustable plate, K, spring, p, and nut, M, substantially and for the purpose set forth.

[By a peculiar means of operating a rake, the grain is raked in gavels from the platform, and discharged from the platform longitudinally with the plane of the movement of the harvester to which the improvement is attached.]

LAMPS—Nathaniel Cradit, of Ripley, Ohio, assignor to Chester G. Robinson, of South Reading, Mass. : I claim, first, The described or equivalent arrangement of draft passages, b l 3, communicating with the oil reservoir, and central tube, Q, conducting the air and gases from thence to the interior of the wick, as explained.

Second, The box, M P Q, and shell, H, in the described combination with two rectilinear sets of wick-elevating pinions, or their equivalents, by which two flat wicks are converted into one circular wick, as set forth.

HEELS FOR BOOTS AND SHOES—Samuel Flint and Robert S. Rogers, (assignors to William F. Johnson), of Lynn, Mass. : We are aware that heels have been made hollow or chambered, and with what is usually termed "hard india rubber," and that such heels have had elastic balls or meniscus shaped pieces or plates of india rubber let into the same, and to work toward and away from the perforated plate of metal fixed in the heel.

We are also aware that such elastic meniscus balls and perforated metallic plates have been applied to the soles of shoes, the whole being described in Charles Goodyear's application for a patent, rejected September 27th, 1856 ; therefore we do not claim such, our improved manufacture of heel differing essentially therefrom, as, in the first place, the india rubber part is a solid block or cylinder filling the whole space provided within the wooden body for its reception. Secondly, the heel contains no unfilled space or chamber between it and the ball, and in which the rubber may vibrate as it does in the heel described by the said Goodyear. Furthermore, the body part of our heel is made of wood. Taking it as a whole, it is a new or improved article of manufacture, wherein the rubber acts as a guard to the wooden body, or as a preventive of wear of the same.

We do not claim a heel made wholly of india rubber, nor one composed of metal and india rubber.

But what we claim is, an improved manufacture of heel made of wood and india rubber combined and arranged together substantially as set forth.

FILE-CUTTING MACHINE—George W. Fogg, (assignor to himself and D. S. Fogg,) of South Dedham, Mass. : I claim, first, Controlling the opening of the regulating valve of an atmospheric trip hammer employed in a file cutting machine, for the purpose of regulating the blow thereof, and producing a uniform depth of cut from end to end of the file by means of a pattern whose form corresponds with or has a proper relation to the longitudinal profile of the file blank, applied and operating upon the said valve substantially as described.

Second, In combination with the arrangement of the cutter guide block, K, at a greater inclination from a vertical plane than the hammer stem, and with the fitting of the cutter or cutter stock loosely in said guide block, I claim the employment of a clamping piece, Z, or its equivalent, applied to the said guide relatively to a proper bearing on the opposite side of the cutter, and operated substantially as described, to produce the peculiar action of the cutter specified.

[This invention consists in so applying a pattern of a form corresponding with or having a proper relation to the longitudinal profile of the faces of a file to be cut, in combination with an atmospheric trip hammer properly arranged to operate on the cutter, that as the cutting of the file proceeds, the said pattern will control the operation of the regulating valve of the air cylinder, and thereby control the depth of the cut all along the file, so that the depth may be made uniform, notwithstanding the taper of the file or the curved form of its faces.]

APPLYING GAS FOR HEATING AND ILLUMINATING PURPOSES—Calvin Pepper (assignor to himself and J. G. Treadwell), of Albany, N. Y. : I do not claim to be the first inventor of a porous gas burner, as I am aware they have been constructed of wire gauze, and by making beds of such material covered with broken pumice-stone ; and by a composition of matter patented by F. C. Kraunse, and by some other substances other than silicious sand, and I do not claim the burning of gas in such way except through silicious sand in a state of division, and I do not claim to be the inventor of passing gas through sand for the purpose of purifying the gas ; I make no claim for burning gas for illuminating purposes only, after having passed through the sand and separate from the same ; I make no claim in this application for the use of gas or sand in a separate state, and I make no claim for the ventilating arrangement described or for the admixture of gas and atmospheric air before burning.

What I claim is passing coal for other inflammable gas alone, or in admixture with atmospheric air through a stratum or mass of silicous sand without aggregation of particles to be inflamed at the surface, substantially as described for heating purposes, and also for illuminating, as incident thereto, as described.

PLOWS—Thos. Wiard (assignor to G. W. Pitken, H. W. Pitken, and W. L. P. Wiard), of Louisville, Ky. : I claim the standard, A, with its permanent wing, B, and recesses or shoulders for the reception of the removable wing, I, constructed and arranged substantially in the manner and for the purpose set forth.

I also claim, in combination with the standard, A, constructed as set forth, the adjustable cutting and guiding wheel, L, so that said wheel may be thrown into or out of action as the circumstances of the case may require and as described.

I also claim the uniting of the handles, beam and standard together, by means of the pockets, a, dowels, e, recesses, f, and bolt, h, substantially in the manner described.

SLIDE VALVE GEAR FOR OSCILLATING ENGINES—Wm. Stephens (assignor to Richard Stephens), of Old Forge, Pa. : I claim, first, The combination of the two independently operating sliding bars, I and P, and the levers, M M', the former sliding bar being connected with the valves rockshaft and furnished with fixed or adjustable stop pieces, N N', and the latter being connected by an arm with the cylinder trunnion, and the whole operating substantially as described to produce the motion of the valve or valves.

Second, Combining the stop-pieces, N N', with the sliding bar, I, by fitting them to slide in slots, 6, in the said bar, and attaching them to a double slotted wedge, S S', applied to the said bar, substantially as described for the purpose of adjusting or varying the lead of the valve or valves.

[A certain combination of sliding bars, levers, stops and rods are employed in this invention, through whose agency the slide valve is caused to derive the necessary motion to effect the induction and eduction of steam to and from the cylinder. There is also a certain means of providing for the adjustment of certain of the stops for the purpose of giving the valve more or less lead as may be desired.]

STEAM BOILERS—I. C. Stern (assignor to Geo. W. Stone), of Philadelphia, Pa. : I do not desire to claim, broadly, the heating of the feed water, by allowing it to pass through tubes in the fire-place, as such a plan has been heretofore devised.

But I claim the application to locomotive boilers of the arrangement of tubes described, that is to say, the arrangement of the coil, b, or its equivalent on the inside and on one side of the fire-box, and the coil, b', or its equivalent on the opposite side when one coil communicates with one pump and the opposite coil with the other pump of the engine, and when the opposite coils are connected together by the pipe, d, so that the cold water direct from the pumps may pass into the coils, and thence in a heated state into the boiler, and so that the water may, at all times, circulate through both coils, as set forth.

LAMP SHADE SUPPORTERS—William F. Shaw, of Boston, Mass. : What I claim as a new article of manufacture is, the lamp shade supporter, C, with its upper and lower springs constructed of a single piece of metal in the manner substantially as specified.

STRAW CUTTERS—Olive Ann Brooks, of Somersworth, N. H., administratrix of the estate of Lebbeus Brooks, deceased, late of Great Falls, N. H. : It is not intended to claim a rotary cutter cylinder and a roller for the cutter to work against, to feed and cut straw ; nor is it intended to claim the feeding and cutting straw in the manner described in the specification of the United States patent numbered 13,807, wherein the knife has a compound motion composed of two circular motions, and operates in conjunction with a roller ; nor is it intended to claim a rotary cutter cylinder or set of cutters and a swinging bed operating together, as shown in the United States patent 12,699 ; nor is it intended to claim a straw-cutting machine, as constructed in such a manner, that its bed and knife shall each operate with a compound motion as described in the United States patent numbered 18,084.

But what is claimed as the invention of the said Lebbeus Brooks, is an improved straw-cutting machine as constructed of two cutting knives or shears, I M, or their equivalents, and so that, while one of them, when the machine is in operation, shall have a compound motion whereby its cutting edge shall be made to move in an elliptical path toward and away from the trough, B, the other shall have only a reciprocating motion in a circular arc toward and away from the said trough, the lever frame carrying the lower knife, or bed, being made to turn on a fulcrum rod, or its equivalent, and to be connected with the upper knife by means or mechanism essentially as described.

Also the application to the upper knife having a compound motion, as described, of a toothed rake, N, to operate therewith and facilitate the feeding of the straw forward in manner as specified.

RE-ISSUES.

PISTOLS AND OTHER FIRE ARMS—Ethan Allen, of Worcester, Mass., formerly of Norwich, Conn. Patented, April 16, 1845 : I claim extending the rear end of the dog or catch, c, rearward and beyond where it is jointed to the tumbler of the percussion hammer and connecting the upper end of the main spring directly to the part so extended, or otherwise connecting the main spring to the dog so as to cause it to operate upon the hammer, dog and trigger.

Also the arrangement of a mechanism in connection with a self-cocking arrangement, whereby I am enabled to make the fire-arm so as to be cocked at pleasure by the hammer, or to be operated entirely by the trigger, a a, self-cocker, and mechanism consisting of the stud, d, and the dog or catch, c, in connection with the tumbler as described, or their equivalents, whereby the same results are obtained.

Also the piece of metal, g, as combined with or applied to the sere of the trigger and in front of the notch thereof, and hook of the catch, c, and operating in relation thereto in the manner and for the purpose as hereinbefore explained.

Also my new and peculiar arrangement of the pitman upon the sere of the trigger, so as to operate, as above described, in combination with the construction and arrangement of the teeth upon the breach or rear end of the cylinder or series of barrels, by which improvement in constructing and arranging the aforesaid parts I am enabled to very much simplify them in comparison with the manner in which they have been made and disposed.

CORN PLANTERS—Nathaniel Drake, of Newton, N. J. Patented, February 2, 1858 : I claim, first, Operating the seed valves, a b, from the traction wheels, A A, by means of the rods or weights, G H, and cams, M N, arranged substantially as and for the purpose set forth.

Second, The agitator, g, arranged with relation to the seed boxes and valves substantially as set forth.

Third, The rib, b, attached to the upper valve constructed and operating as shown and described for the purpose stated.

Fourth, Combining with one of the weights which operate the valves, or its equivalent, a cam-shaped gear wheel corresponding in form with the cams which operate said weights.

Fifth, Extending the chains which operate the valves down under the pulleys, d', back of the axle, so as to obviate the slackening and taking up of the chains by the vibrations of the plows, d, and their attachment as set forth.

[This invention consists, first, in a peculiar means employed for operating the seed-distributing device ; secondly, in the use of a seed-agitating device. The object of the invention is to obtain a machine that will plant two or more rows simultaneously, and at the same time the seed-distributing device of each hopper allowed to be under the complete control of the operator, so that either or both may be so actuated as to ensure the accurate planting of the seed in check rows, and also to prevent the possibility of the clogging or choking the seed-distributing device.]

ORGANS—William Sumner, of Worcester, Mass. Patented February 28, 1854 : I claim the combination or arrangement and connection, with the keys, of a mechanism which shall enable the extreme key touched on either side, or hath when operating itself, shall prevent all the others from operating in the stop or stops, connected therewith in the manner and for the purposes as set forth and described.

I also claim controlling and operating the escape valve by means of friction on the arm, or its equivalent, in the manner and for the purposes set forth and described.

THE MANUFACTURE OF ELASTIC CLOTH—Horace H. Day, of New York City, assignee of Richard Solis, of said New York. Patented Nov. 7, 1849 ; I claim the new elastic cloth described, consisting of a woven textile material (or cloth), having the threads of the warp oblique to the weft, combined with gum elastic or India rubber, so that the two constitute an elastic compound fabric.

ADDITIONAL IMPROVEMENT.

ROTARY PUMPS—Levi Burnell, of Milwaukie, Wis. Patented Aug. 31, 1858 : I claim operating three or more pairs of sliding valves in said pump by means of the joint action of the rotary valves, box b, and the three-sided stationary cam, f, substantially as set forth.

MANUFACTURE OF SOAP—Dalrymple Crawford, of Toronto, Canada. Patented March 13, 1858 : I claim using the refuse of Indian corn, and mixing it with a fat or oil and an alkali, and with or without resin, amalgamating the same to make soap.

I claim subjecting the refuse of Indian corn to an alkali, with or without heat, and modifying the strength of the alkali when too strong and not required by an acid, and for the purpose of mixing it more easily with the soap.

DESIGNS.

PARLOR STOVES—Garretson Smith and Henry Brown, assignors to Liebrandt, McDowell & Co., of Philadelphia, Pa.

COOK'S RANGES—Garretson Smith and Henry Brown assignors to G. Abbott and A. Laurence, of Philadelphia, Pa.

BOOK MARKS—William B. French, of Charleston, Mass.

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New Inventions.

Reward to a Telegraph Inventor.

The Bavarian government has decided to give a sum of money to Professor Steinheil, of Munich, as the original inventor of the electric telegraph. This gentleman had a telegraph in operation between Munich and Bogenhausen, a distance of 12 English miles, in July, 1837, and this the Bavarians think entitles him to priority. They fully acknowledge Morse's improvements, however, but wish to give honor where honor is due.

Something New on the Strength of Boilers.

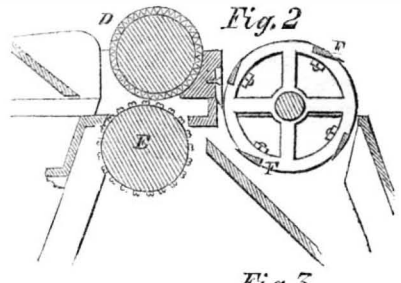
A contribution of great importance, has lately been made to our knowledge of the laws regarding the strength of boilers, by W. Fairbairn, C.E., Manchester, England. From experiments he has found that the intensity of pressure required to make a flue or other thin tube collapse, is directly as the square of the thickness of the metal, inversely as the diameter, and also the length. The new point of discovery, is that which relates to the diminution of strength as the length of a flue is increased. Such a law was not hitherto suspected; it was always supposed that the extended length of a flue did not, in the least, affect its strength, but that this was determined alone by the thickness of the metal, and the diameter of the flue in the boiler. The following is the rule which has been laid down for computing the pressure in pounds on the square inch, which a wrought iron flue can sustain. Multiply the constant factor 806,000, by the square of the thickness of the metal in inches, and divide the product by the diameter of the flue in inches, and of its length in feet. It is necessary to the strength of the flue that it should be exactly cylindrical. This is a most important question for boiler makers and engineers. The discovery throws much light on the frequent collapsing of long flues, most of which are made of too thin metal to withstand the great pressure to which they are exposed. By strengthening long flues as recommended by Mr. Fairbairn, with rings of T-iron placed at certain distances apart, they can be made at a little extra cost as strong as short flues.

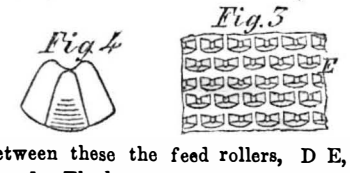
Improved Straw-Cutter.

All the usual and most economical cattle feed, such as corn stalks and sugar cane, have their fibers so strongly bound together that before giving them to the cattle it is well to prepare them by separating their fibers, and in some measure masticating them, without, however, depriving them of any nutriment. The masticator which is the subject of our illustrations can also be used as a straw-cutter, and it will be fully understood by reference to the accompanying gravings.

Fig. 1 is a perspective view of the machine, and Fig. 2 is a section of the feed rollers and cutters.

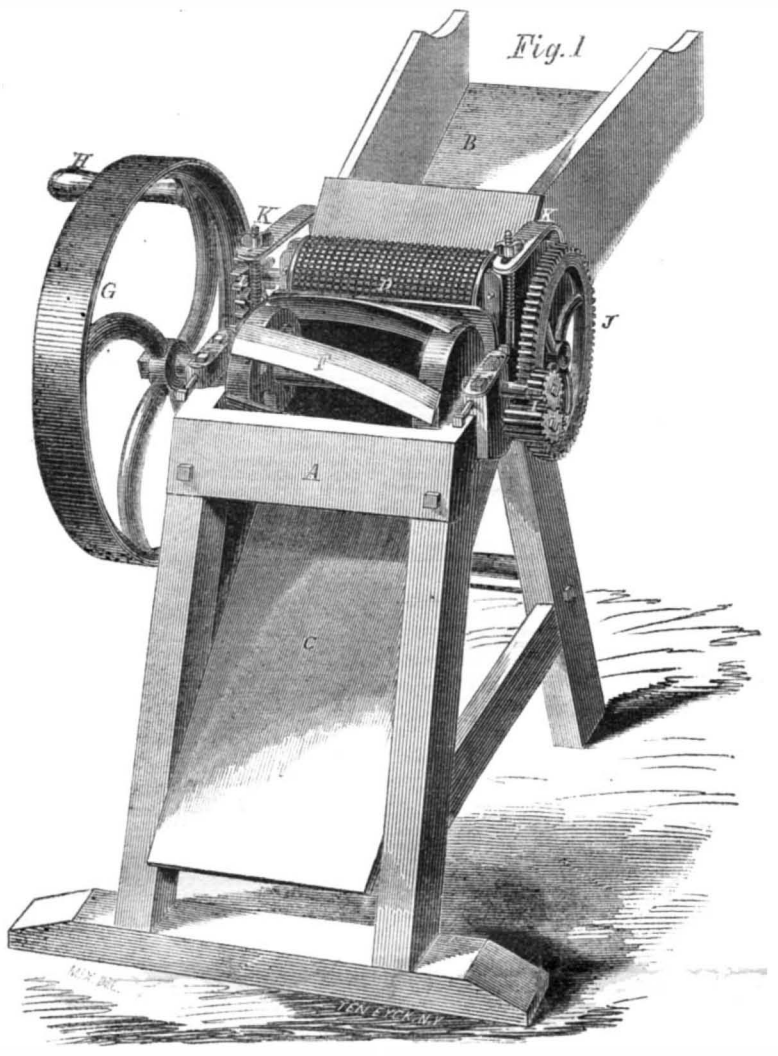
To a frame, A, is attached a feeding spout or trough, B, and a delivery incline, C.





Between these the feed rollers, D E, are placed. The lower one, of which E has upon its surface a number of teeth shaped like the molar teeth of animals, running in a zig-zag line, which masticate and thoroughly break up the stalks and fodder as it feeds them to the cutters. The arrangement of these teeth will be seen in Fig. 3, which is a plan or projection of part of the cylinder, E, and Fig. 4, which is a view of a single tooth (enlarged in proportion) seen from its convex side. The cutters, F, are arranged spirally on the shaft of the fly wheel, G, that is rotated by the crank, H, on which shaft is also the gearing, I J, that moves the feed rollers or masticators. The feed rollers are kept in contact by spring, K, and they are connected at their ends by cog wheels, L. This machine making four cuts, and having the power directly

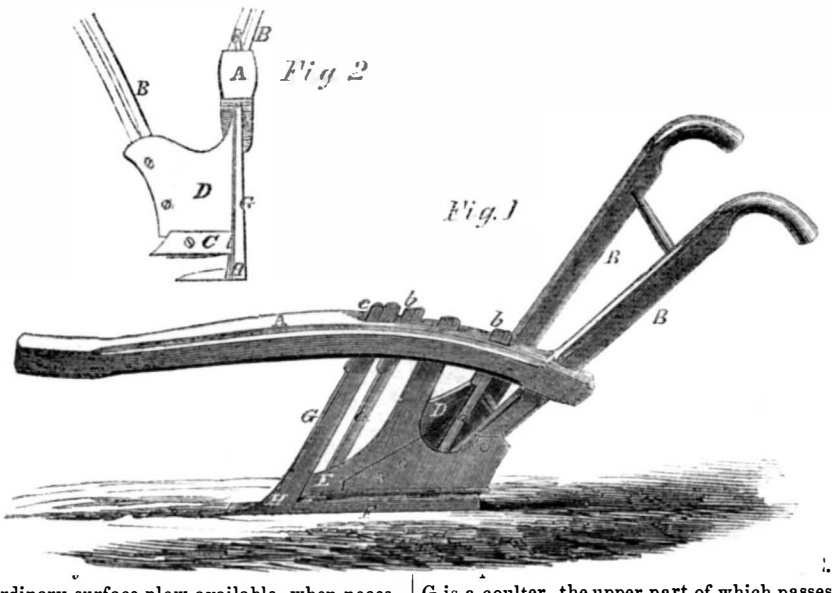
SINCLAIR'S STRAW-CUTTER AND MASTICATOR.



applied to the cutters it can be worked with great rapidity, and is altogether a great improvement on the "screw-propeller cutting machine" made by the same individual. The knives are provided with a cover to protect them from rust and also to prevent accident when they are in motion, and it is held in position by springs, and can be easily removed.

The inventor is Robert Sinclair, Jr., of Baltimore, Md., who will be happy to furnish any further particulars or information. The patent is dated July 20, 1858.

DICKSON'S IMPROVED PLOW.



ordinary surface plow available when necessary as a sub-soil one. To effect this, a supplemental land-side and a coulter attached to the plow are used. Fig. 1 is a side, and Fig. 2 a front view of the improvement.

A is the beam, B B the handles, C the share, D the mold board, and E the landside of an ordinary surface plow. F is a supplemental land-side, having two upright bars, *a a*, attached to it; they pass through the beam, A, and are secured in proper position by the keys, *b b*, the land-side, F, being at G is a coulter, the upper part of which passes through A, and is secured by a key, *c*, and the lower end of G has a share, H, formed upon it, and a groove is made in the back of the coulter, that the front of F may fit therein.

The share or lower end of G is about on a line with the land-side, F; and the coulter and land-side, when adjusted below the upper and side, E, as seen in Fig. 2, forms a subsoil plow. The supplemental land-side, F, may be detached at any time with the coulter G, and the implement may be used as an ordinary surface plow.

The beam and handles can be constructed of wood, as usual, and the share, C, mold board, D, and land-side, E, as well as the coulter, G, and supplemental land-side, F, are of metal. The implement may be constructed very cheap, and it will work in either of its double capacities as well as one constructed for the special application.

The inventor—Alexander Dickson, of Hillsboro, N. C.—will be happy to furnish any further particulars upon being communicated with. A patent was obtained June 22, 1858.

Sewing Machine Patent Cases.

The following exceedingly useful information to patentees and others, relates to important patent suits instituted by O. B. Potter and N. Wheeler against Stedman & Holland, for infringing the re-issued patents granted to Allen B. Wilson a the feeding device for sewing machines by which the operator can turn the cloth while the machine is in operation, so as to sew a seam of any desired curvature.

Several months since, on applications for injunctions to the United States Circuit Court, sitting at New Haven, Conn., the defendants in these cases raised the objection that the re-issued patents were void, because Wilson made the surrender of the original patent, and took the re-issues while he was not the sole owner of the patent, and that it required the concurrence of all persons interested in the original patent to make a valid surrender under the act of Congress.

It appeared, by the record of the cases, that at the time Wilson made the surrender of the original patent for a re-issue, there were some States which he had disposed of, and for which he did not own the whole interest in the patent.

The cases, on this question of law, were afterwards argued at Hartford, Conn., by Messrs. Baldwin and Ingersoll, of New Haven, and George Gifford, of New York, for the complainants, and Messrs. Dickerson and Brady, of New York, for the defendants, before Judges Nelson and Ingersoll; after which a decision was rendered by Judge Ingersoll, concurred in by Judge Nelson, in favor of the complainants, and sustaining the patents, and in which it is decided:—

First, That a surrender of an original patent, to be operative, may be made by the patentee alone, where there is not an outstanding assignment, or by the assignees of the whole patent, and by no other party.

Second, That an assignee, in the sense of the patent law, is one who has had transferred to him either the whole patent or an undivided interest in the whole patent.

Third, That a purchaser and owner of a patent for a specified territory, as for a State, is only a grantee, and not, in the sense of the patent law, an assignee, and need not join or concur in a surrender of the patent for a re-issue.

Fourth, That persons holding interest under the patent, other than as assignees or grantees, thus defined, are only licensees, and have nothing to do with the surrender.

Fifth, That a surrender and re-issue of a patent does not necessarily destroy the original patent, but that, on the contrary, grantees and licensees may claim and hold under either the original, after surrender, or the re-issue as they shall elect; but that after electing, they are bound by their election, and cannot in any case claim under both.

Sixth, That where a surrender is made by the patentee, and there is an outstanding assignee, the surrender may, at any time be made operative by a ratification by the assignee.

These cases have since been argued on the merits by the same counsel, before Judge Ingersoll, and a decision has not yet been rendered. All these questions of decision are of great interest, especially the first, fifth and sixth, which embrace novel features; and they will be precedents for future action.

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Scientific American.

NEW YORK, DECEMBER 25, 1858.

Our Artificial Light.

Artificial light is as necessary for the development and enjoyment of man, as fire and clothing; and this light is not merely necessary to man in an advanced state of society, but in the very rudest forms of social life. Every tribe and nation use artificial light of some kind—from the South American Indian, with his taper of caoutchouc, to the cultivated denizen of our city, with his jet of gas. All our great physical apostles of civilization—steam-engines, telegraphs, and a host of wonderful inventions—might be dispensed with easier than artificial light. It has been found that the best lighted cities are, proportionably, the most free from crime, because robbers can skulk in dark streets, and pursue their nefarious practices with comparative impunity. The first city which was lighted with gas was London. This was in 1814—sixteen years after some private manufactories had adopted it, and proved its convenience and economy.

It seems that our people were somewhat tardy in adopting gas illumination, as in 1833 there were only three of our cities lighted with it. In 1834, the city of Philadelphia sent an agent to Europe to examine into the most improved methods of manufacturing gas; this resulted in the erection of the most perfect gas establishment on our continent in that city, in 1836. At present there are about 200 gas companies in our country, and the number is increasing rapidly. The amount of gas consumed is prodigious, amounting to about 4,000,000,000 cubic feet annually. The city of New York alone consumes 1,130,000,000 cubic feet, at $2 50 per 1,000 feet, amounting to no less than $2,825,000. There are 330 miles of main gas pipes laid, and 11,200 street lamps supplied. The price of gas varies in different cities; in Pittsburg, it is $1 60 per thousand cubic feet; in Philadelphia, it is $2 13; in New York and Boston, $2 50. The price of coal in Pittsburg is only $1 50 per tun of 2,000 lbs.; in the other cities named, it is $6 50 per tun of 2,240 lbs. These prices account, in a great measure, for the difference in the price of gas in those cities. In Philadelphia, however, the gas-works are the property of, and are managed by the city, while those of New York belong to joint stock companies. The cost of gas annually to consumers in New York is $418,100 more than it otherwise would be if sold at Philadelphia prices.

Besides the two hundred gas companies alluded to, there are a large number of factories in our country, where gas is made from coal, resin, and oil, on the premises. Gas is, undoubtedly, the cheapest and most convenient light for cities, but it cannot be manufactured economically unless upon a somewhat extended scale; other lights, therefore, must always be employed extensively for small villages and private dwellings. Oils made from coal seemed to present a beautiful, safe, and economical light for general purposes in dwellings, and they rapidly rose in the estimation of the public; but recently we have received a great number of complaints against these oils, both as it regards their price and character. In consequence of the urgent demand for them, their price has been raised above that of the best sperm, and great quantities in a half refined and adulterated condition, are being thrown upon the market. There appears to be a revulsion of public opinion going on against such oils, and they may go out as fast as they came into public favor. We have recently heard many complaints also, against burning fluids (mixtures of four parts of alcohol to one of pure turpentine), on account of adulterations in them, so that many persons who formerly burned spiritous fluids have lately returned to the use of fixed oils.

Resin oils are durable, but very smoky; still, they may be so purified, or lamps may be invented, so as to render them fit for common use; and were this the case, such oils could be sold at a profit, for one-third the price of coal or sperm oils. A wide field, well worthy of investigation to the chemist and mechanic, we believe, is here presented.

Another point to which we wish to direct attention is, the improvement of methods for burning gas. By the use of open burners, the products of combustion pass into the atmosphere of rooms, and poison it. It is a barbarous practice, very similar to the burning of fires in a house without a chimney. The pale and exhausted countenances of persons subjected for several hours to sitting in a crowded church or music hall lighted with gas, afford painful evidence of breathing in a poisoned atmosphere. It would not be difficult to arrange public buildings so as to conduct the burned gas products by tubes into chimneys in the walls thereby promoting health and the means of greater enjoyment, as an impure atmosphere always tends to depress the spirits. This is a question which deserves the attention of architects and others in regard to the erection of new public buildings, all of which can be fitted up with the improved arrangements suggested.

Saving Fuel and Heat in Steam Boilers.

One year ago we directed public attention to the great waste of fuel and loss of heat in steam engines, and stated our opinion that about twenty millions of dollars were wasted annually in our country by defective combustion and bad use of steam in boilers and engines. Since that time we have received several letters in corroboration of our statements, and expressing pleasure at the prominence which had been given to the subject. We indulged some hopes that good would result therefrom, by inciting inventors and mechanics to make experiments and seek out improvements. We are happy in being able to state that considerable progress has been made in this branch of practical engineering during the past year. The importance of such improvements will be appreciated, when it is taken into consideration that the Collins' line of splendid steamers are at present rotting and rusting at our docks, because of their inability to earn enough to meet their enormous expenditure—a principal item being the great consumption of fuel. About one thousand tuns were usually stowed away for each voyage; eighty tuns were consumed per day, and the evaporation of steam was but eight and a half pounds to the pound of coal. The cost for fuel amounted to more than four thousand dollars per voyage, while the great space required for the storage of the coals greatly curtailed the room for carrying profitable cargo. If, by any improvement, the quantity of fuel required can be reduced one-half in such steamers, a saving for coal of more than two thousand dollars will be effected for each voyage, and the extra space obtained for cargo will yield a profit of between six or seven thousand dollars. Can such results ever be effected? An affirmative answer to this question is beyond all doubt. The experiments of F. B. Blanchard, of this city, with the steamer *John Faron*, as illustrated and described on page 412 of our last volume, afford proof that twelve and a half pounds of water were evaporated by each pound of coal, or nearly one half more steam than the quantity generated in the Collins' steamers with a like amount of coal. This is very favorable in regard to what has been done in securing greater economy in combustion in boilers on this side of the Atlantic, in 1858, and we have equally favorable reports from the other side of the ocean in regard to economy in another feature of steam engineering, namely, in the expansion of the steam in the cylinders. A late number of the London *Engineer*, quoting (from the Liverpool *Albion*) a description of the new steamer *Cullao*, built by Messrs. Randolph & Elder, of Glasgow, for running between Valparaiso and Panama, on the Pacific, states that it run at the rate of 13 knots per hour, using only 2.98 lbs of coal per horse power. The engines of this steamer have double cylinders—one a small, high pressure, and the other a large expansion one—into which the steam is exhausted from the small one and expanded upon the Woolfe principle. Another steamer, built by the same parties, called the *Valparaiso*, of a similar model, and with like engines, has been running for two years on the coast of South America, and it consumes only about one half the fuel required by other steamers on the same route, which have side-lever engines of the very best construction. This vessel ran from Valparaiso to Panama and back with 640 tons of coal, while all the other steamships on the station consume 1,150 tons. Such has been its economy of fuel, that the company to which it belongs have made arrangements to have all their other vessels fitted with similar engines. The present ones are to be taken out, although in the best order and capable of being used for quite a number of years to come. The economy of fuel and the acquirement of the space to carry cargo effected by this steamer saves $10,000 per voyage to the owners, in comparison with every other vessel in the same service. It was also stated by J. Macquorn Rankin, C.E., F.R.S., President of the Scottish Institution of Engineers, in a recent address, that a new steamer, called the *Admiral*, lately built for the Emperor of Russia, with like engines, by Messrs. Randolph & Elder, only used 2 19-20 lbs. per horse-power, per hour, as tested by him in several experiments, which amounted to a saving of nearly one-half the fuel in comparison with other steamers generally considered first class.

By these improvements in the combustion of fuel in the furnaces of boilers, and in the working of the steam in the engines, we think we are not too enthusiastic in our expectations that steamers equally as powerful as those of the Collins' line will yet equal them in speed, with a consumption of fuel diminished at least one half.

The Hoosic Tunnel—Railroads.

The railroad tunnel which is now being bored through the Hoosic mountain in Massachusetts—one of the highest elevations of the *green mountain range*—is a work of great importance. When completed, the length of the tunnel will be four miles of solid rock excavation. Gangs of men are now at work on each side of the mountain, the drifts have been carried to a distance of 2,400 feet, and the work is progressing at the rate of about 300 feet per month. The State of Massachusetts granted a loan of two millions of dollars for this undertaking, and the first instalment of $100,000 has already been paid the rest becoming due as the work progresses. The line of railway, of which the tunnel is to form a part, is now finished from Boston to Greenfield—105 miles—on the east side, and the portion on the west side—49 miles—between Troy and North Adams, is to be opened about Christmas. There will then be a space of 30 miles, including the tunnel, to be completed to establish a continuous line of 164 miles between Troy and Boston. This enterprise, when accomplished, will reduce the railroad distance from Troy to Greenfield 65 miles, also the summit level 700 feet, and the gradients from 81 to 30 feet, at the same time obliterating several miles of curvature. It also shortens the route and reduces the gradients and curvature between Troy and Lowell, Nashua, Lawrence, Boston, Salem and Newburyport, and the cost of transportation will be one-third less between these places.

An unwise policy has hitherto governed the construction of our railroads. They have been built hastily and as cheap as possible; consequently, their permanence and durability were overlooked. This has led to vast amounts being swallowed up annually for repairs and working expenses; hence, with few exceptions, all our railroads have been unprofitable investments to the stockholders. A more wise policy, we trust, will hereafter rule in the railroad interests of our country.

Acoustic Ocean Telegraph.

Some of our cotemporaries propose a tubular pneumatic telegraph for the Atlantic ocean. The proposition is an exceedingly absurd one, and those who propose it advance the most unscientific arguments in its favor. They lay down the following as a fact:—

"It is established that a whisper can be heard through a tube a mile in length with the some distinctness as it can be at a foot distant from the speaker. Why, then, cannot a word spoken audibly be heard two thousand miles through a whispering tube at the bottom of the ocean?"

It has never been established that a whisper can be heard, as stated, through a speaking tube a mile distant; and those who are accustomed to speak through tubes know that such is not the fact, and, according to the law of mechanics, cannot be. Every sound is propagated to a distance just in proportion to the amount of power exercised to produce the sound, whether in a tube or otherwise. Speaking tubes concentrate this power, and consequently can convey it to a greater distance than when spoken in the free atmosphere, and allowed to spread over a greater area; and this is the whole secret of conveying sounds to great distances in tubes. But when the body of air in a tube presents a *vis-inertiæ* greater than the *vis-insita* which produces the sound, of course the sound will cease to travel further. A tube of iron or steel, if laid in the ocean, would soon be filled with water by the immense superincumbent pressure; the water would be forced through the pores of these metals as through a fine sieve.

Constructing Submarine Cables.

A correspondent—David Baldwin, of Goodwinsville, N. J.—directs our attention to the faulty manner in which the Atlantic and other submarine cables have been constructed in their external covering. This is composed of twisted iron wires *served* upon the cable in the form of a spiral. It is asserted by our correspondent that this outer covering tends to form kinks in the cable, when suspended and under strain, by its efforts to untwist. It is well known that common ropes suspended from the masts of ships often untwist and form into kinks; hence the ocean cable, being subject to the same law, must have formed into kinks in several places also. This is the conclusion of our correspondent, and his views have been corroborated by the recent lifting of the shore end of the cable at Valentia, Ireland. When the party employed were underrunning the cable, they discovered a kink which exposed the conducting wire to the action of the sea water, and thereby fatally injured its conducting capacity. The remedy proposed for this evil in constructing ocean cables, Mr. Baldwin says, "is to serve upon the first wire covering a second counter-twisted coating of wire which, although it may render a cable less flexible, will enable it to be laid safely in any depth of water."

This is a good suggestion, and one well worthy of application in the construction of all submarine telegraph cables. By consulting recent foreign papers, we find that Messrs, Stevenson & Binks, of London, have manufactured a cable which, we think, will obviate the difficulties pointed out. It consists in forming the outer wire covering with wires plated in a braiding machine similar to that used for braiding picture cord.

Committees on Patents.

The following are the names of the Senators and Representatives constituting the Committees on Patents and the Patent Office:—

Senate—David Reid, of North Carolina, Chairman; Thompson, of New Jersey; Toombs, of Georgia; Simmons, of Rhode Island; and Trumbull, of Illinois.

House of Representatives—J. A. Stewart, of Maryland, Chairman; Niblack, of Indiana; Edie, of Pennsylvania; and Brayton, of Rhode Island.

The only changes that have been made, are the appointments of Mr. Toombs in place of Mr. Yulee, and Mr. Niblack in place of Mr. Maclay; otherwise the Committees are the same as last year.

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OUR MANUFACTURES.

(Illustrated.)

HOE & COMPANY'S PRINTING-PRESS AND SAW MANUFACTORY.

It is our intention, in this article, to take cognizance of "things new and old" which possess merit and deserve consideration, so that, out of the treasury of practical mechanism, we may be able to convey such information as will not only be interesting, but instructive and beneficial to all.

The subject of our present illustrations is the manufactory of Messrs. R. Hoe & Co., in Sheriff and Broome streets, this city. The principal office of the company is in Gold street—Nos. 29 and 31—where orders are received and sales effected, and in connection with which there is quite a large and well arranged machine shop, where neat steam engines, &c., are built; but our object, at this time, is only to describe the larger manufactory, between which and the "down town" office there is a line of electric telegraph, for the purpose of constant and rapid communication—thus evincing promptness and energy on the part of the proprietors in conducting their business.

One advantage possessed by European manufacturers over those of our country is the experience which has been accumulated during several generations, and which has been transmitted to the direct descendants of those who introduced various manufacturing arts. Each race has grown up with the business and acquired knowledge to conduct it in the most skilful and economical manner; whereas, joint stock companies, so common with us, are necessarily subject to frequent changes, whereby the wisdom, skill, and experience acquired by one set of directors are often lost to those who succeed them in business. The advantages, however, of accumulated experience, combined with skill, ingenuity and enterprise, belong to those who conduct the establishment we are about to describe.

The manufacture of presses and other printers' furnishings was founded by Robert Hoe, father of the present proprietors, and their uncle, Peter Smith, both very skillful and ingenious mechanics. At the father s decease in 1834, his sons continued the business, and soon extended its proportions. At the period of time referred to, their annual sales amounted to about fifty thousand dollars, now they reach the sum of six hundred thousand; then a comparatively small shop in Maiden-lane sufficed for their operations, now two large establishments scarcely afford room for their purposes.

The manufactory ~~now under consideration~~ of Messrs. R. Hoe & Co. New York occupies a large space in Sheriff street, runs along Broome, and extends into Columbia street. It is not the extent of its domain which has rendered it famous, but the character of the operations conducted within its walls; as it is here where the "Hoe Mammoth Rotary Presses" have been constructed for the giant daily newspapers of the New World, and some of the most distinguished in the Old; and here it is, also, where those great saws are manufactured which rip up the lofty pines of Maine and the towering red wood groves of distant California. The building is a substantial four story brick structure, amply provided with all the necessary adjuncts to render it as convenient as possible. The main entrance is through a porch in Sheriff street, in which is one of F. E. Howe's large weighing scales, set on an incline, and with a trap door in its centre for depositing articles in the vault below. Beyond the entrance there is an open court, on the left hand side of which is the iron planing, drilling and boring shop, fronting on Sheriff street; opposite is the forging smithy, and in one angle is the engine-room, situated between the forging and saw-smithing department, all on the ground floor. The engine, which is here represented by the accompanying illustration, figure 1, first attracted a visit, as it is the iron Hercules of the establishment. It is of the beam class—our favorite—and has a cylinder of 34 inch bore and five feet stroke, with valves

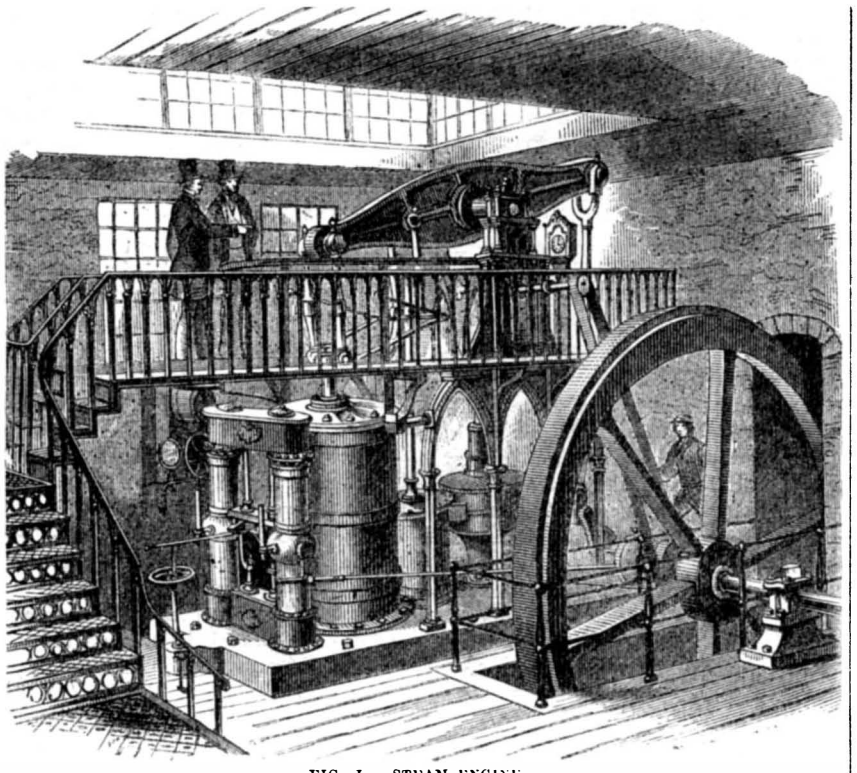

FIG. I.—STEAM-ENGINE.

operated by "Sickles' cut-off"; it is about one hundred and thirty-five horse power; its condenser is supplied from a deep well in the yard, and its workmanship does credit to its builders. This engine has taken the place of a smaller one of horizontal pattern, which was formerly employed, and the most beneficial results have followed the change. In the old one, the steam had to be maintained at a very high pressure in order to do the work required of it, and the boiler room—as a natural result—was heated like an oven. Now, mark the result of using a capable and improved engine! With the very same boiler, and a much reduced pressure of steam, this engine does all the work with ease and with only one-third the quantity of fuel formerly used in the boilers. To this must also be added a greater supply of spare steam for heating the various departments, thus affording astonishing economical results. The steam for heating the different shops is conveyed by pipes from the boilers, which are situated in a low position, by which arrangement, and a proper valve, the condensed steam in the pipes is permitted to trickle back and perform the same office over and over again. This engine blows the bellows, drives the grindstones, turns the lathes and planes, operates the huge punching machines, and swings the ponderous tilt hammer.

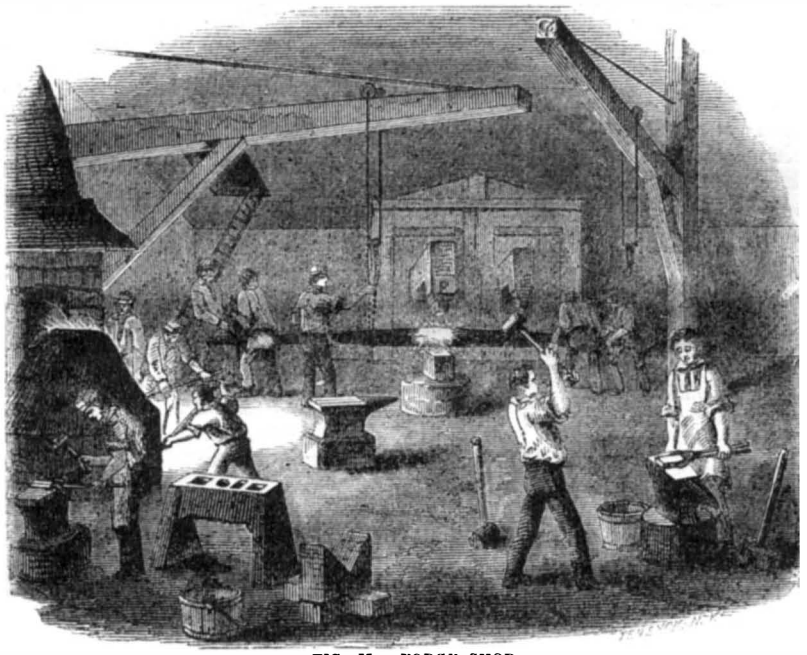

FIG. II.—FORGE SHOP.

The next apartment, represented by figure 2, is the blacksmith or forge shop, which is quite extensive. The bellows of the fires are operated by steam power, and a large shaft is represented as being forged into proper form by "the steam arm," which never tires. The bar now undergoing the forging operation is swung by a crane from the fire to the anvil, on which it is regularly turned to the action of the hammer by a wheel lever secured at one end and actuated by the operative in charge. There are nineteen forge fires arranged around the walls, and each smith (who has an attendant hammerman) is generally employed upon that species of work in which he most excels, so that the greatest perfection in fabrication is thus secured by constant practice and subdivision of labor. In this shop there is also a swaging machine for forging bolts, spindles, &c. Great exactness is necessary in having all forged work executed in the best manner and of the best materials; hence the most skillful workmen only are employed.

The foundry where the castings are molded is situated behind the shop just described, and extends into Columbia street. It is a lofty apartment, in which quite a large number of hands are constantly engaged. All the parts of presses, and other machines made of cast iron, are here molded, such as bed-plates, tubes, wheels and racks. The best American pig iron is used for this purpose, as it is has to sustain great pressure and heavy strains. The molding of iron requires much experience and skill, as an error in casting either requires the article to be broken up and recast, or much extra labor has to be expended in chipping, boring or planing. At a short distance from the south angle of this department there is located a small brass foundry, considerable brass work being required for some parts of hydraulic and other presses exposed to moisture and corrosion.

The next figure (3) represents the method by which the teeth of saws are cut in the shop which extends along the floor of the building fronting on Broome street. We will now describe the operations connected with the manufacture of saws, and to this branch of business we invite especial attention, because of the originality and peculiarity of some of the manipulations involved, and the high character of the saws which are here fabricated.

The best cast steel plate, imported to order from England, is used; and in the blank state it comes in the form of discs, of several sizes, for the circular saws; and in narrow plates for the various kinds of reciprocating long saws. The primary operation, in making circular saws, is to flatten the plate if it is warped; then the centre hole is drilled for the spindle, and two small holes for the spindle-collar; after which the large steel disc is ready for having the teeth cut around its edge. It is, for this purpose, secured, as shown in the figure, on the rotating bed of the punching machine, and is then gaged so as to rotate, with an intermittent motion, synchronous with the up-and-down movement of the punching beam. The bed on which the saw is placed stands still until the cutter or punch is forced down upon it to cut out a piece of steel, and leave the edge standing of the exact size and form of tooth required; then the cutter or punch rises, the saw on its bed now rotates the exact distance for another tooth, then stands until the cutter again punches out another space for a tooth, and so on until the whole series are formed on the plate. The intermittent rotary motion of the saw plate is governed by a pawl and ratchet—the latter on the bed or anvil, and the former on an arm moving horizontally but in unison with the motion of the punching beam. The power required for punching out a solid piece of thick steel for each tooth is very great, but this machine—to use a term employed by Dr. Livingstone in reference to the lion's jaws—*crunches* them out as easily as if it were chopping windle straws. In order that the machine should be ready for action

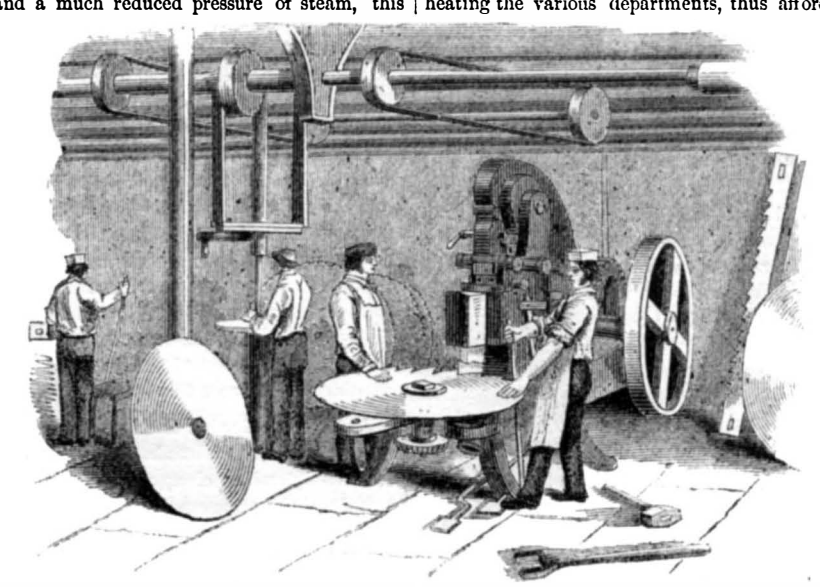

FIG. III.—CUTTING TEETH OF SAWS.

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so as not to throw it out of running order when a plate has to be shifted, the beam is always kept in motion, but the punching block is furnished with a very convenient clutching arrangement for throwing the cutter or punch and the beam in and out of gear. This clutch is a jointed lap, connected with the angle lever shown at the one side of the figure, by which the operative having charge throws the lap in and out of connection, under the chin of the beam, at pleasure. The cutter block for punching is connected with strong coiled springs at each side, which render it self-acting, to elevate it when the beam rises. When all the teeth are formed on a saw, the lap-clutch is thrown out of gear, the screws which secure the plate to the bed are unfastened, the saw taken off and another blank plate substituted.

Long saws are toothed by the same machine, but the rotary bed is not then moved. The plates of these are carried transversely below the punch, and the teeth cut out regularly by a positive intermittent motion. Another similar machine is employed for cutting the teeth of smaller saws. When the fabrication of saws was first established in this place, twenty-four years ago, the teeth were punched out by a hand screw press, and the saws, in blank, were also guided by hand; much guess work, as a consequence, was connected with the operations, and four men were necessarily required to handle large plates. With one of these improved machines two men will turn out fifty times more work per diem, and with far more accuracy, than four men by hand labor.

After a certain number of saws have been toothed, they are next submitted to the hardening process, as the steel, in blanks, is comparatively soft. This operation is represented by figure 4, which exhibits the furnace and the cooling bath. The saws are carefully placed in the furnace and raised to a high and uniform temperament, after which they are taken out and immersed in the bath, which is composed of oil, resin and some other substances, and has the property of hardening them to the proper degree. This process requires great care and experience to render its execution correct. The metal must not be raised to an undue temperature, or it will become brittle by the cooling action; and it must reach a certain temperature or it will be too soft. All parts of each saw must also be equally heated, or there will be hard and soft spots left in it; and the teeth are very liable to be of unequal temper unless the utmost vigilance is exercised. Thick saws require no additional tempering after this process, but thin saws are heated to render them elastic. All kinds of saws are hardened in this manner.

The next operation through which the saws pass is that of smithing, which is performed in the shop in which they are toothed; and consists in submitting them to the action of hammering by hand labor, on anvils, to flatten them for the grinding operation, which is represented by the annexed figure (5), and is conducted in the basement of the building. This method of grinding the circular saws is peculiar to this establishment, and is the invention of Col. R. M. Hoe, for which he obtained a patent in 1843, renewed 1857, and which was extended for seven years. Each saw, as represented in the figure, is secured accurately in a vertical circular rotating box, and the lap which reduces its surface to a smooth face slides back and forth, bearing against the saw and slightly reducing it from the centre to the circumference. The sand and grit for grinding is fed into the lap box in a wet state by the attendant, and the saw revolves in its box against the reducing lap. This is the true method for grinding circular saws, and it gives important advantages to the inventor in this business. Prior to its introduction, such saws were all ground by hand labor. This work was very laborious, tedious and liable to incorrectness, yet this method is still practiced by those who have not the use of this improvement. When one side of a saw is reduced, the other is turned and undergoes a similar operation. After a circular saw is supposed to be equally

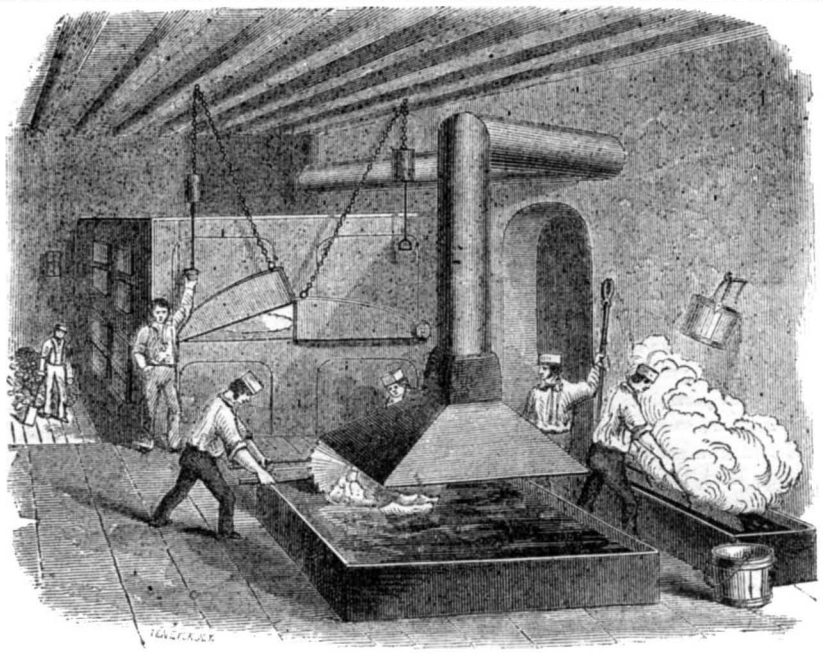

FIG. IV.—HARDENING SAWS.

reduced throughout, it s not left to mere inspection, but is placed on a free spindle—almost frictionless in its bearings—and submitted to the test of balancing, by giving it a gentle rotary motion and allowing it to return to rest. If one part is heavier than another it will seek the centre of gravity, and will always be found on the lowest side when the saw comes to rest. Whenever a saw is observed to do this, the heaviest side is marked with chalk, and afterwards reduced to uniformity with all the other parts. Great care is exercised to have every saw true and uniform in weight throughout all its parts, because the slightest error in this respect renders its liable to *wabble* when placed in a saw-mill. The next operation which the saw undergoes is that of polishing, which is similar to that of grinding in every respect, excepting that the powder used is dry.

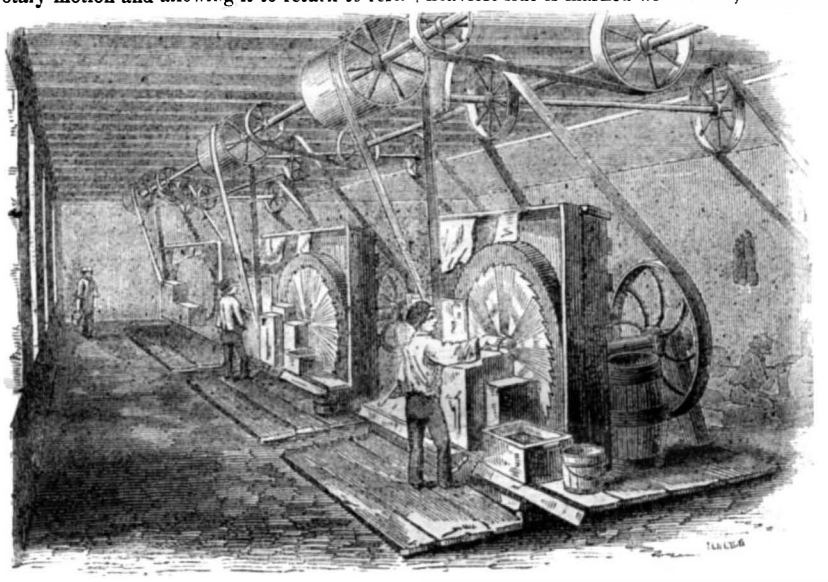

FIG. V.—GRINDING CIRCULAR SAWS.

FIG. VI.—BLOCKING SAWS.

The subsequent manipulation which it undergoes is that of "blocking," which is executed by hand, and, to appearance, is very simple, as represented by the annexed figure—6. We have been informed, however, (and a brief examination will soon convince any person of the fact,) that great skill of hand and eye, and the exercise of a good judgment, are requisite in the managing operative. His duty is to render the face of the saw perfectly true, and for this purpose he strikes it here and there, where he knows the metal requires to be *drawn*, and submits it to frequent tests with a try square. Each operative has an attendant for turning and holding the saw on the block; and as the correct running of every saw depends greatly on the manner in which this operation is executed, great attention is required to render it as perfect as possible. The smithing and blocking operations are carried on in the long shop in which the saws are toothed. and it is an interesting sight to witness an extended row of mechanics engaged n such work. Each circular saw, after it is blocked, is placed on a free spindle, represented by the accompanying figure (7), to test the accuracy of its face. A small try-edge is placed, as shown, close to the face of the saw, which is revolved in the same manner as in the balancing test described. The foreman of this department examines the try-edge, viewing it between himself and the light, to determine the accuracy of the saw's face. If found untrue, it is again blocked until perfect correctness is attained; after which the saw is cleaned up, is ready for putting on its shaft for final use, and is sent to the storehouse in Gold street. The straight saws are submitted to the same operations in the same room as the circular ones, excepting balancing and trying them on a free spindle. They are also ground in a different manner from that represented in the foregoing figure. They are reduced on huge grindstones by hand labor, the operatives for this purpose being men of strong arms and iron nerves. Each saw is held on the face of a huge stone, which revolves at a high velocity, and, when new, is six feet in diameter. The operatives bear down with their whole force upon the saws against the stones, and shift the position of the surface to be reduced until both sides are ground equally. Gang saws for large mills, single saws, and muleys for small mills; long whip saws, for pits in shipyards, and cross-cut saws; in fact, every variety of large saws and minor sized saws are manufactured by Messrs. Hoe. The circular saws range from a few inches in diameter up to eighty inches—nearly seven feet.

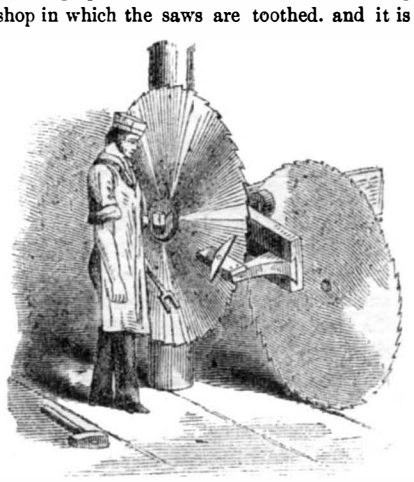

FIG. VII.—TESTING SAWS.

Circular saws are now very extensively employed for sawing every description of timber, both in the log and in ripping stuff, such as boards and planking. They are more compact and require less space than the long reciprocating kind, and their cutting action is uniform and constant from the beginning to the end of the operation. When first introduced into our country, for sawing logs, much prejudice had to be removed and considerable practice acquired to manage them. They are now coming into more general favor, and possess advantages, in certain circumstances, over all others. On page 283, Vol. VIII., Scientific American, a correspondent who had erected several saw-mills in various parts of our country, says of Messrs. Hoe's saws:—"A great amount of time and money has been expended in bringing these saws to perfection, and those who have seen them in operation assert they are not exceeded by any in use. A saw of 54 inches will run 600 revolutions per minute, cutting three-quarters of an inch at each; and when rightly put up, they never heat nor require water to keep them cool like some other saws." The velocity, thus stated, at which these saws can be run without heating, amounts to more than a mile and a half at the edge per minute. This affords proof of their accuracy of construction, and the quality of their material.

Having thus presented somewhat full information regarding the manufacture of saws in this establishment, we will now refer to some other mechanical operations. In the front shop, on the floor, in Sheriff street, are several gear cutters, planers, and iron drilling machines. The annexed figure (8) represents an improved gear cutter operating on a toothed wheel of five feet in diameter, intended for a printing press. The wheel is cast like a pulley, and afterwards turned on the edge and side of its rim before it is placed in this machine. There are to be 300 teeth cut on the wheel represented, each equi-distant from the other, and all of equal depth. The blank wheel is set to be rotated intermittently according to the space between the teeth. The small burr wheel, represented on the vertical spindle, rotates with considerable velocity, and

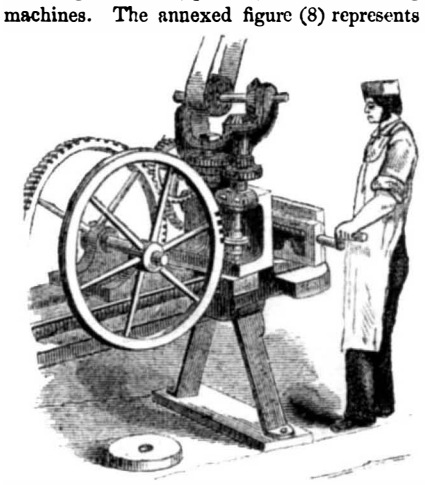

FIG. VIII.—GEAR CUTTING.

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cuts the exact depth into the face of the wheel for a tooth, then stops by a self-acting movement, the blank wheel moving a certain distance for another tooth, and so on until all are cut. The teeth are thus formed by the metal being left standing between the spaces cut out by the burr wheel. Various sizes of wheels and racks, for printing presses, &c., are cut with equal facility in this machine.

The beds and platens of printing, hand and hydraulic presses are here planed smooth by machines, most of them having movable reciprocating cutters. Most of the improved iron planing and slotting machines and lathes employed in this manufactory were made by A. M. Freeland, of this city, who has obtained much celebrity as a tool-maker, but there are also some most excellent machines made by Whitworth & Co., of Manchester, England.

PRINTING PRESSES.

The apartments above the ground floor are devoted to various operations, but principally that of making and fitting-up printing presses. Here at all times may be witnessed single and double cylinder presses of various sizes, in different stages of construction. Power presses for every city, and every part of our wide spread country, are being continually fabricated; and such are the skill, the resources and abilities of those who have charge of, and who execute the different operations, that very many new and intricate machines—new inventions—are entrusted and submitted to them to be reduced to practicability. Several new machines, to order, may generally be witnessed in the course of construction in this department; one which we noticed, for printing railroad tickets, was of very intricate workmanship. A new printing press, for a Boston publisher, was also being fitted-up, together with severa others requiring great accuracy of operation.

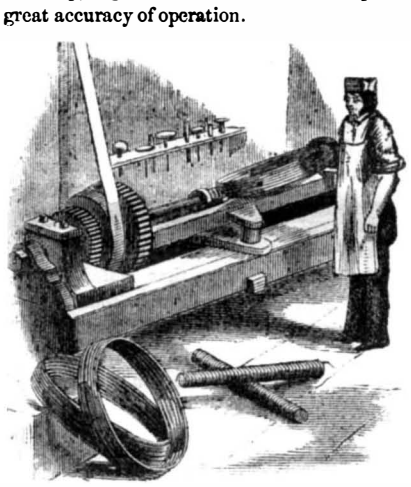

FIG. IX.—COILING SPRINGS.

It is in this department also where Hoe's great "Mammoth Rotary Presses" are fitted-up, and reduced to practical working order before they are sent out. The fame of these printing giants has led to their representation in a former volume of the SCIENTIFIC AMERICAN, and in several other illustrated periodicals, and the public is now somewhat well informed in regard to their powers and utility; we, therefore, have not deemed it necessary to present an engraved view of one at this time. The importance of the invention of this press cannot be over-estimated. The daily papers of our country would have been limited in their circulation had it not been produced to meet the wants of the public. The New York *Herald*, *Tribune* and *Times* have four presses in which ten impressions are taken during every revolution of the type cylinder, and they can throw off 20,000 copies per hour with ease. Several other daily papers in New York, Philadelphia, and other cities have eight cylinder presses, which are nearly as rapid in action; and there are quite a large number having six and four cylinders now running. The *Illustrated London News* is printed on one of six cylinders, which was sent from Hoe's establishment, and *Lloyd's Weekly Newspaper*, in London, on one of the same dimensions. The Manchester *Guardian* is printed on one of four cylinders—Messrs. Hoe's make—and the *Examiner* on one of similar size, by Whitworth, under Mr. Hoe's patent. In Europe, as well as in our own country, it is held to be *the press of the world*. The preceding figure (9) illustrates the mode of forming the large coil springs on which the journals of the inking rollers rest. It is made of the best iron rod and placed on the spindle of the lathe, which, as it revolves, coils the iron rod around it, and a guide directs the pitch necessary between each spiral or thread. A visit to one of the printing-rooms, when one of these large presses is in operation, is as great a treat to a stranger as is a visit to the Falls of Niagara. Improvements are continually being made in printing-presses, and we were shown a very important one recently attached to the flat bed cylinder press, for equalizing the pressure on the parts during the period an impression is taken, so as to render it more durable and correct in action. All the parts of these presses, from the most minute screw to the largest cylinder, wheel and rack, are, from their incipient stage to the last finishing touch, executed in this manufactory. This perfect control of all the materials and workmanship insures much greater perfection than could otherwise be secured.

A very large business is also carried on in the upper part of the building, situated in Columbia street, in making printers' furnishings, such as cases, &c. Large stacks of sawed cedar and white wood are here kept standing for long periods, in order that the timber may be perfectly seasoned before it is finally used, as such joiner's work must be exceedingly exact, to prevent warping and shrinkage. A Daniels' planer and several circular saws are in continual operation for preparing the stuff. The room is heated by steam pipes, and every means provided to insure safety and comfort.

In connection with this joiners' department there is also the pattern shop, where the most scrupulous attention must be paid to the most minute feature of the work to be completed, in order to insure accuracy through all the subsequent operations. Some patterns are very valuable, as they involve a great amount of patient labor and study, hence they are carefully protected from fire or other accidents, because, if lost, it would be very difficult to replace them.

On the opposite side of the establishment, in Sheriff street, is the office of the superintendent and clerks, the draughtmen's room, and a photograghic gallery in the attic story. Here, too, is the telegraphic station, in which are the key and recording instruments for transmitting and receiving lightning messages to and from the main office in Gold street. Working drawings are here executed by the draughtsmen for all new machines, and for new parts of different form to improve old machines. Correctness in proportion and arrangement of parts in the drawings are absolutely necessary for the future guidance of the pattern-makers and mechanics. In the photographic room copies are taken of objects, the likenesses of which are desired for distribution or preservation. This part is under the charge of the principal draughtsman, who appears able to handle a pencil of sunlight as facilely as one of camel's hair.

Throughout the whole of this manufactory, in which about four hundred mechanics are employed, a strict regard is paid to all details, and order reigns in every department. Under the gentlemanly attention of Mr. Bowen, the superintendent, we were afforded every facility for examination, and he furnished us with a lucid and ready explanation of every machine which, from its complex character, was difficult to understand without a very long period for observation.

Power to Drive Circular Saws.

The power required to drive circular saws depends on the character of the timber to be operated upon and the amount of work to be turned out in a given time. In sawing southern yellow pine, twelve horse power is required for a circular saw 52 inches in diameter, running at the rate of 4,600 feet per minute at the periphery, with half an inch feed per revolution. In sawing white wood, spruce or soft maple, nine horse power will suffice to run a saw at the same velocity. By using a variable feed in a saw-mill, the same steam engine or water wheel can saw all kinds of timber—the feed being slow for hard and knotty logs, and quicker for soft free timber. A five horse power water-wheel or steam-engine can drive a circular saw of 52 inches diameter by proportioning the feed of the log; of course, it should be less than one half that of the saw, running with half an inch feed.

Gang saws are superior to all others for sawing logs where ample power can be obtained. They can be run at the rate of 150 strokes per minute, with a feed of a half inch per stroke; and in some mills in Maine they cut 50,000 feet of boards in twelve hours with ease—five in a gang—with circular saws for edging. As gang saws are made thinner than those employed singly in a gate, they economise the timber in cutting, and they also cut more accurately, as the logs do not spring so much; they being held more steady to the cutting action. Lumber cut by gang saws is about 20 per cent superior to that cut by a single saw, and it sells at such an advance in price in the market.

There are differences of opinion regarding the merits of the common gate and the *muley* saw. The latter is much used in Ohio, but the other is still the greatest favorite in most other sections of our country.

Iron and Steel Improvements.

Considerable sensation was produced among iron manufacturers in 1856 by an invention called the "Bessemer process," which consisted in blowing air through the molten pig iron as it was run from the cupola furnace, by which action, it was stated, a portion of the carbon in the iron united with the oxygen of the air, and was thus disengaged in the form of carbonic acid, whereby the metal was purified at one continuous operation, and converted into good malleable iron and steel. This invention was illustrated in our columns on page 32, Vol. XII., and a patent afterwards taken out for it, in our country, by Mr. Bessemer; but it was subsequently set aside in a case of interference with Wm. Kelly, of Lyons county, Kentucky, who was held to be the first inventor.

Since that period reports have prevailed that the merits of the invention had been grossly exaggerated; in short, that it was a failure. Such reports seem to have recently met with a confutation from G. F. Goransson, a large iron manufacturer at Eskden, in Sweden. He uses a converting vessel situated near the taphole of the blast furnace, and into this he runs the fluid pig iron—one ton at a time—then lets in the blast to it, at seven pounds pressure, for about seven minutes, by which action the iron is converted into steel. The temperature of the pig iron rises, by this operation, to a degree which could not be attained in three hours in the common air furnaces containing the iron in crucibles, and using an amount of coke equal to three times the weight of the metal. A large iron ladle, lined with loam and similar to that used by molders, is suspended in a crane near the converting vessel; into this the fluid steel is discharged and stirred for two minutes with a steel rod. This action liberates carbonic acid, which rises in a high flame; after which the metal is allowed to repose one minute, then run in a vertical stream into ingot molds from a *jit* in the bottom of the ladle. The whole time occupied, from the moment the fluid pig iron leaves the furnace until it is cast into the mold, does not exceed twelve minutes. The loss in weight, including the impurities thrown off, does not exceed 15 per cent, which is only about one-half the waste incurred in the manufacture of bar iron by the old system in Sweden. By this improvement Mr. Goransson states, in a letter to the London *Engineer*, that more than 1,000 tons annually of cast steel can be made with the same quantity of fuel as is now required for making 500 tons of bar iron. He says:—"So completely have we accomplished the object, that we now make several tuns of large ingots of cast steel, in succession, without a single mishap or failure of any kind. The steel can be made either hard, medium, or soft at pleasure. It draws under the hammer perfectly sound and free from cracks or faults of any kind, and has the property of welding in a most remarkable degree."

These are important results well deserving the attention of our iron manufacturers, as the Swedish steel thus made has been tried in England and found to be of excellent quality for tools, &c. If such things have been done in Sweden they surely can be effected in America. In England we doubt if such success can be secured with the iron ores of that country, all of which contain either sulphur or phosphorous, of which impurities the Swedish ores are remarkably free. But in our country we have ores equal to those of Sweden, such as the magnetic ore of New York, Pennsylvania and the Lake Superior region, and with these such results can surely be attained. It would also appear that all varieties of pig iron can be greatly improved by this process, if good steel cannot be made from them, and for this reason alone it should be more generally applied.

Draining of Farm Lands.

It is said that the most successful farmer in New York—Mr. Johnstone, of Ontario county—is also a most thorough drainer of his lands. Draining is, no doubt, one of the most effective means of increasing the product of the soil, and any useful information on this question is of much value. At a recent meeting of the Farmer's Club, held in this city, Professor Mapes gave expression to some very useful and practical ideas on the subject. He said he preferred drains five feet deep and eighty feet apart, to those three feet deep and twenty feet apart. Generally his plan cost no more than the other. The land never puddles near the drain; the water enters from below—never from the sides. Between the drains the water of falling showers forms an arch in the earth, below which, for a short distance, the earth is saturated, but above it never. Until this arch is flattened to the lower level of the drain the water will continue to issue from the drains. The five-feet drain then secures two feet more of earth in depth than the three-feet drains. He urged the necessity of keeping both ends of the drain open to the admission of air—the upper end being secured so by a pile of large stones reaching to the surface—and the circulation of air through it should be sufficient to extinguish the light of a candle placed at the upper opening. Another use of the drain was, that it made a mulch in effect of the upper inch of soil over the whole field.

Books in Turkey.

MESSRS. EDITORS—It may be interesting for your readers to know that the first and last work on medicine, in the Turkish language, was printed in Scutari in 1820. It was called: "Mirror of the Bodies," a folio sheet, with 300 pages, containing 56 anatomical plates. The publication of this work was hailed in Europe as a great event, considering that the *Koran* forbids to make plates of the human body. It is never allowed to open a body, even if, as the Koran expresses it, "the dead person should have swallowed the most precious pearl, which did not belong to him." The author was Cham-Zadeh, Mehemmed-Ata-Ula, a member of the Ulemas. It is remarkable that a particular Hatte-sherif—an edict of the Sultan—was required to allow its publication.

Printing was first introduced in Constantinople in 1726. It was interrupted again from 1743 till 1784, and since its introduction until the late war broke out—that is in a period of over 100 years—only about sixty books have been published! What a stupendous fact to dwell upon, considering one year's issue in the United States! GALEN.

TELESCOPES.—Good results need not be expected at the moment when a telescope is transported from a warm room into a cold atmosphere. If the mirror of a reflecting telescope is not of the same temperature of the surrounding air the vision will be imperfect.

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The Elastic Force of Steam.

When different liquids are heated to their boiling points, they produce very unequal quantities of vapor, water giving much the largest. One cubic inch of water giving 1728 cubic inches of vapor, while the same quantity of alcohol gives 528, ether 298, and turpentine 193 cubic inches, thus showing that fuel can be most economically employed in the production of steam.

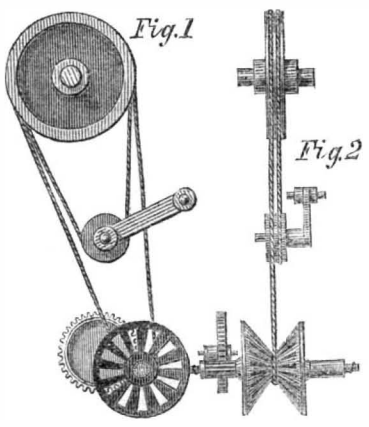
Dulong and Arago made some researches upon the elasticity of steam, which throw considerable light on its mechanical effect. Their results show that as the temperature increases a given increment of heat produces a greater effect in augmenting the elastic force, than at a lower temperature. If the atmospheric pressure, or the elasticity of steam at 212° Fah., be taken as unity, the elastic force of steam at 240° Fah. will be about one and a half, and at 250° Fah. about two atmospheres. Thus an increase in the quantity of heat indicated by 38° Fah. doubles the elastic force, and it also appears that a further increase of 25° Fah. trebles the elastic force, and a further increase of only 18° Fah. quadruples it. The elastic force therefore increases much more rapidly than the temperature.

An Expanding Pulley.

The accompanying illustrations represent an expanding pulley, which for many situations and purposes may be very convenient, and superior to a set of cone pulleys for which it is used as a substitute. The figures and the description—in substance—are taken from the London *Engineer*, and it formed the subject of a paper read before the late meeting of the British Scientific Association. Fig. 1 is a side elevation, and Fig. 2 a front view of the pulley.

If we suppose two cones made with radial spaces alternating with solid parts, and the one made so as to slide freely into the corresponding spaces of the other on the shaft or axis, we shall have a very correct idea of this pulley. The sizes of the radial sections of the cover are so regulated that when the two cones are put together they form a V-shaped pulley, the diameter of which varies according to the position which the cones occupy with regard to each other.

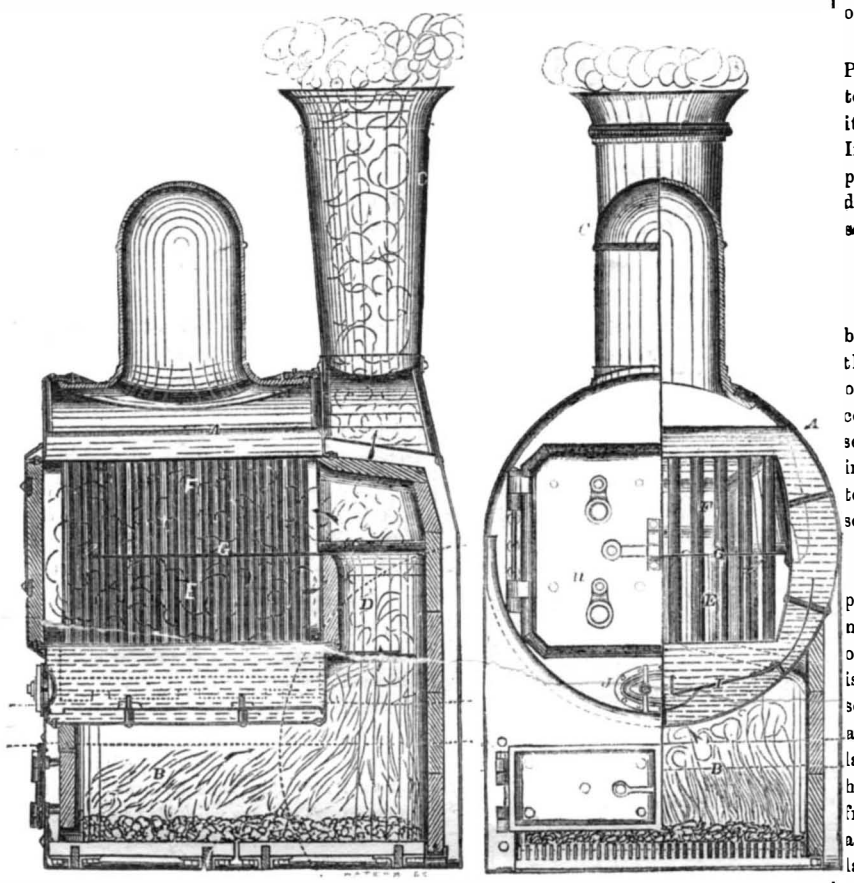
It will be observed that a great variation in



the size may be obtained without the pulley occupying so much space as a common gang of pulleys. These pulleys are manufactured by James Coombe, machinist, of Belfast, Ireland, author of the paper mentioned, and a very simple mode is represented of applying a stretching pully to one of them. The band is passed twice around, with the expander in one fold and the stretching pulley in the other. When two expanding pulleys are used—the one to drive the other—it is not necessary to have any stretching pulley. Objections may be urged against the V-pulley, because a flat band cannot be employed on it, but for many purposes a round belt is just as good. A round gut band has been used for seventeen months on one of these pulleys driving a sixty-spindle roving frame in a flax factory, and it is nearly as good as when first put on. A pair of these expanding pulleys were employed on a drilling machine at Leeds, England, at the recent Exhibition of Local Industry, and they were capable of being easily changed from 4 to 16 inches in diameter while the machine was running, thus obtaining a variation of speed from 20 to 320 revolutions per minute, with all the intermediate speeds. These pulleys were first employed by Mr. Coombe for giving the varying motion to the bobbins in flax and tow roving frames, for which they are well adapted.

A few years ago, application was made by one of our inventors for a patent on a similar pulley applicable to the feeding bed of a saw-mill, so as to gig back quickly; but it was rejected on the grounds (which were deemed unreasonable by the inventor and others) that *expanding reels* were old, and therefore the pulley was not patentable. Such pulleys are now therefore free property in our country, and may be made and used by any person who wishes to drive lathes, roving frames, and all machines which require variable speeds.

MONTGOMERY'S PORTABLE STEAM BOILER.



The accompanying illustrations represent improvements made by J. Montgomery on his well-known boiler, to render it very portable, safe and effective, so as to adapt it for boats running on canals, and for other purposes of an equally important nature. We will state as briefly as possible the principles which are involved in the generation of steam, and which should govern the arrangement of the heating surface of boilers, and the manner in which these are embodied in this boiler.

The steam, as formed in boilers, has a tendency to adhere to the surface of the metal, and the impurities in hard water are also liable to adhere either to the bottom or the sides, according to their chemical character; that is, sulphate of lime adheres to the whole surface, while the carbonate falls to the bottom. To obviate these attendant difficulties, a constant circulation of the steam and water is necessary, so that the surfaces of the metal may be kept clean and in constant contact with the water. Economy of fuel, the space occupied, strength, durability and facilities for cleansing, repairing and attendance, are also necessary in a good steam generator.

Fig. 1 is a vertical longitudinal section, and Fig. 2 a transverse section of the above-named boiler, and an examination of these will show how the above conditions are carried out in this boiler.

It consists essentially of two parts—an outer shell, A, and an inner box in which the tubes are secured. These latter, therefore, have what may be called a "water jacket," and a complete circulation is established with the water space below and above through the tubes (which are not flues), thus securing a constant circulation through them, so as to carry up the steam as rapidly as it is formed, and prevent the deposition of scale on their inner surfaces.

The steam dome is made with a large manhole plate, by the removal of which three-fourths of the tubes are exposed for repairing or cleansing when required. B represents the furnace, which has doors its whole width to afford facilities for firing. The tubes are vertical, by which arrangement, with that of the heating surfaces, the circulation is promoted in the most effectual manner. There is a large door, H, which allows of the flues between the parallel rows of tubes being easily swept, and to serve (should occasion require it) to check the draft, by admitting a large quantity of air among the tubes, to reduce the pressure of steam rapidly. J is the manhole of the boiler. The tube box is divided by a partition plate, G, which forms two flue spaces, F and E, thus giving the heated products of combustion an extensive circulation in a small space, so as to economize the heat, and allow more time for perfect combustiom in the furnace, by the upper course first, and then the downward course of the draft. The heat from furnace, B, passes up at the back end of the box, thence through the upper tube chamber, as shown by the arrow, thence returning at the front end down at door, H, through the lower tube chamber, E, and passing by a split cone to the smoke chimney. By this course of the draft, the heat is economized and the fuel saved, and the heat of the tubes kept more uniform than if the highest heat had all been employed at the lowest ends of the tubes. The steam in the dome is also kept more dry, which is an important feature, as wet steam is liable to injure the working of an engine. This arrangement also secures a more uniform expansion and contraction of the tubes. The crown plate of the boiler is not liable to be injured by heat, as water or steam must pass up the tubes constantly while there is water in the boiler. In form and arrangement this boiler appears to be strong, durable and convenient. The illustrations are presented as a demonstration of its portable character, and of possessing the qualities and advantages claimed for it.

Further information may be obtained by addressing Mr. Montgomery, at No. 8 Bowling Green, this city.

Printing on Glass.

"Printing on glass has been successfully accomplished by a gentleman in New York city. By a new process he is enabled to print letters and figures, of various designs, on glass of multi-colors, with a facility almost equal to ordinary printing on common paper, Labels can be printed by this process directly on bottles of any size or form. These have the appearance of having been placed there by the hand, and are indelible. Lettering on glass, by the new process, can be done at less than one-third of the present cost."

[The above paragraph, clipped from the Philadelphia *Saturday Evening Post*, was sent to us by a correspondent with an inquiry as to its correctness. We believe it is unreliable. If there is any person in this city, who can perform a feat in printing on glass like that described, we wish that he would report himself, and show us a specimen of his skill.

A Valuable Present.

James Lennox Esq., of this city,—whose benevolence is proverbial—has presented to the New York Historical Society, a collection of Assyrian marbles from Nineveh. They consist of thirteen slabs, each averaging seven square feet in area, in thickness eight inches, and the total weight is about seventeen tuns. They are in *bas relievo*, with the sculpture in the cuniform character.

A Domestic Recipe.—A father, who had passed innumerable sleepless nights, has immortalized himself by discovering a method of keeping babies quiet. The *modus operandi* is as follows: As soon as the squaller awakes, set it up, propped by a pillow, if it cannot sit alone, and smear its fingers with thick molasses; then put half a dozen feathers into its hands, and it will sit and pick the feathers from one hand to the other until it drops asleep. As soon as it wakes again, more molasses and more feathers; and in place of the nerve astounding yells, there will be silence and enjoyment unspeakable.

Rosewood Stain.—Take one pound of red sanders and one pound of logwood, and boil them together in half a gallon of water for half an hour, adding half an ounce of sal soda. Put this on the wood hot with a brush or sponge. When dry, the wood may be varnished with lac. One, two or more coats may be used, according to the depth of color required.

Black Stain for Wood.—Boil half a pound of logwood in two quarts of water, add one ounce of pearlash, and apply it hot to the wood with a brush. Then take half a pound of logwood, boil it as before in two quarts of water and add half an ounce of verdigris, and half an ounce of copperas; strain it off, and this go over your wood a second time.

Black Walnut Stain.—Take half a pound of logwood and a pound of fustic, and boil them in two quarts of water for half an hour, then apply the clear liquor with a sponge or brush. The shade can be rendered as dark as may be desired, by giving a succession of coats, allowing each to dry before the other is applied.

Mahogany Stain.—Take four ounces of red sanders, one pound of fustic and an ounce of logwood and boil them in half a gallon of water, for one hour, then apply it warm with a brush or sponge; when dry, apply varnish.

Mann's Felly-Bender.—In our notice of this invention on page 100 of the present volume, Scientific American, the patent was dated 1856; it should be 1858.

Employers cannot make their workmen or apprentices a better New Year's gift than by giving them one year's subscription to the Scientific American.

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A Story, with Illustrations and a Moral.

There is a story told by the Eastern fabulists something like this: "Once upon a time the course of a river was interrupted for some distance by rugged rocks and small cascades. At that spot it was narrow also, and the stream, in consequence, was swift, turbulent and dangerous. Far up the river, and on the numerous streams that fed it, were large and small cities, all of which wanted to send the products of their industry down to the sea, there to be distributed over the whole world; but these rapids were the great obstacle. One ingenious man suggested they should be removed. But that was over-ruled, as it would inundate the country below. Another proposed a canal, but that was impossible, for the rocky mountains rose high and rough above them on either side, and the poor citizens scarcely knew what to do. At last a generous man said he would try and do his best to overcome the difficulty, and, taking a small boat, he explored the obstacles until he knew every inch of water—dangerous and safe. Coming back to the cities he told their inhabitants he would establish himself at the rapids and would pilot the freighted barges to the safe waters below. His proposition was accepted, and many thousand valuable cargos he piloted safely through. From each boat he took a small toll, but such was the gratitude of the people that they continually were sending to him testimonials and thanks for the good service he had rendered them; and sincere, indeed, were the good wishes bestowed on him by those who got rich by his pilotage of their boats, and they were many."

The Eastern moral is, "Be not content in merely paying for kindness, be grateful also." "But what can this have to do with the SCIENTIFIC AMERICAN?" asks the reader, in amazement at our usually scientific quill taking a story-telling turn. Be patient, gentle reader, and read the following extracts from letters recently received by us, as exemplifying the practical application of the above precept:—H. D. Wickes, of Flint, Mich., writes, on Dec. 10:—"Your letter of good tidings came to hand yesterday. I feel ever grateful to you for your kind attention, knowing you have done all in your power to bring this decision about." This was on the occasion of the issuing of his patent.

O. B. Thompson, of Western Reserve College, Hudson, Ohio, writes as follows:—"I am happy to acknowledge the receipt to-day of yours, together with the letters patent for my lock. I feel myself under obligation to you for the accuracy and despatch with which my business has been carried on, and though, if I fail, I have spent more money than I can well afford, I will still have the satisfaction of knowing I have tried."

W. Harvey, of Albany, N. Y., says, in a letter to us:—"I need not assure you of the great pleasure I feel in tendering you my heartfelt thanks and gratitude for the prompt and efficient manner in which you have conducted my business with the Patent Office and brought my case to a favorable close."

J. Moore, of Bart, Lancaster co., Pa., (a notice of whose invention will be found in another column) writes Dec. 10, in the following terms:—"Yours of the 6th inst. has been duly received bringing intelligence of your success in procuring a patent for our railroad car brake, which is glorious news to me; and to you I shall have to attribute praise for your skill in conducting a case which seemed so difficult. 'All's well that ends well.'"

A. R. Bodley, of Princeton, Ill., says:—"It may not be uninteresting to you to hear how we have succeeded with our washing machine. It is now a little over two months since we received our patent through your agency; since which time we have sold over *ten thousand dollars*' worth of rights for manufacturing, and have not been out of two counties to do it. Our machine has taken the first premium at every fair where it has been entered, and, in a number of instances, over four to ten other machines."

J. Mackenzie, of Cleveland, Ohio, writing on Dec. 13, remarks:—"I received my letters patent on the 11th inst., and am highly satisfied with the prompt and careful manner in which you have managed the business. Your charges have been no more than I had to pay to another agent for the case I trusted him with, and which he lost. I am confident, had I trusted my previous case to you, I would have been saved the cost of an application."

Philander Perry, of Troy, N. Y., writes:—"It will be only the just dictate of gratitude should I express my high appreciation of yourselves for the liberality and promptness with which you have carried my late patent to a successful issue. I particularly admire your sagacity, as well as honesty, in discovering and securing an important claim, which I saw not; and I shall not be slow to recommend your patent *corps* to the many inventors who need such assistance; indeed, sirs, I have thus recommended you and have secured several applications, and another important application, through my influence, will shortly be made to you."

E. Conroy, of Boston, Mass., is also a grateful friend. He says:—"I have much pleasure in informing you that I have this morning received my third and last patent, secured through you, for improved machinery for cutting corks and bungs, from the Patent Office in Washington. All the claims I put in are allowed, and all my hopes and expectations are, thus far, completely realized. In the midst of my satisfaction at this successful issue of many years of arduous labor and study, a feeling of joy and thankfulness pervades my mind at the thoroughly business-like tact and masterly style which you have at all times displayed from the first commencement of my intercourse with you, in conducting and forwarding my several applications for patents through their several stages of advancement—from the first rough embodiment of my ideas down to their triumphant completion, which I behold in these elaborate and (to me) invaluable documents (the patents and assignments) which are now lying on my table, bearing the broad seal of this great republic of science, literature and commerce. These papers explain and describe, in the most beautifully simple, lucid and concise terms, the particulars of my inventions and improvements already referred to, and reflect the greatest possible credit on their talented compilers. Permit me further to express my sentiments of gratitude and delight for the very courteous treatment I have invariably received in your office, both from yourself and from every employé in your establishment. If the publication of this letter (which I have penned from motives of duty, and as only a just acknowledgement of the immense services you have rendered me) will be agreeable to you, I fully authorise you to make this or any other use of it you may think proper."

Frank Chase, of Sutton, N. H., writes on the 11th inst., that he has sold the patent on a blind which we took out for him in 1855, and he encloses a new invention on which he wishes us to obtain a patent.

And, lastly, comes a tribute from J. Ericsson, the well-known inventor of the hot-air engine, screw propeller, &c. It is dated Dec. 16, and is as follows:—"I have duly received from the Patent Office, a patent for improvements in hot-air engines, dated Dec. 14. Pray accept my best thanks for your potent aid in the matter."

Now then, reader, do not the foregoing extracts remind you of the Eastern story? They are but a few items from the many of similar import that come to us in the regular course of business. We quote them to show the hesitating inventor, who is arguing within himself whether it will pay to secure his invention, that patents *do* sell and that money *is* made by patentees.

The testimonials also show that our clients are not insensible, in point of gratitude, to those who have aided them in securing their rights, which acknowledgement gives us far greater pleasure than the amount of fees which they pay us for conducting their business. This is Christmas time. Another year has rolled around, and thus it is a fitting period for all to cast a retrospective glance over a twelvemonth past, and meditate upon what has been done amiss or what has occurred to make the heart glad. In our meditation we have thought of much that we have said and done amiss, but in all our dealings with hundreds of patrons during the past year we do not recall one instance in which our clients have not been satisfied with our dealings with them; and it is specially gratifying when we take a wider scope in our meditation, and look back over a dozen years, to find that, of the many thousand patents obtained through our agency, we are not aware that any one of them has proved invalid from defective claims, when tested before our courts of law. These are the enjoyments of reflection.

In the list of sixty-eight patents issued last week, the claims of which will be fonnd on another page, twenty-five of the number were secured by us. This is present satisfaction.

We are also grateful that the inventors of this truly inventive country have, by general acclamation, declared that the Scientific American Patent Agency is *the* patent pilot (the good man of the story) of the United States. We repeat, this is Christmas time, and thankfully and sincerely we rejoice.

Something more about Salt.

In the very center of the State of New York there are extensive beds of salt far below the surface of the earth. Geologists assert that the sea waves once flowed where these saline deposits are now found; be that as it may, however, hundreds of miles of plain, hill and mountain now intervene between them and the ocean. They are valuable as a source of revenue and wealth to the State, employing a capital of about three millions of dollars. The amount of salt sent from these springs to market this year is 6,800,000 bushels, of which 4,500,000 were shipped from Syracuse by way of Oswego for the Canadas and the Upper Lake districts. Very little of this product comes east to tidewater, it being mostly used in the interior. The salt is obtained from deep brine wells in the vicinity of Syracuse, the brine being partly evaporated by solar and artificial heat. Large sheds, covering hundreds of acres of ground, contain the troughs for exposing the brine to the sun in summer; but in winter the brine is evaporated in pans, and the salt obtained by a forced concentration. The skimmings of the salt-pans are sold to farmers in the neighborhood for fertilizing purposes, and when mixed with wood ashes, they make an excellent top dressing for grass lands.

The Banyan.

This is a kind of Indian fig, the *ficus indica* of Linnæus, forming a very large tree, which sends down roots from its branches, and those roots striking into the ground themselves become trunks, which serve as props to the extending branches; and as the tree is very long-lived, the quantity of ground an individual tree will thus cover is incredible. Dr. Roxburgh says, he has seen the tree 100 feet high, and full 500 yards in circumference round the extremities of the branches. It is found wild in the skirts of the Circar mountains; its leaves are used by the Brahmins as plates to eat off of; a species of birdlime is obtained from its juice, and the fruit is eaten by birds.

LIEUT. MAURY, in one of his lectures on the "Highways and Byways of the Ocean," states that animal matter, at the bottom of the deep sea, owing to the superincumbent pressure, the exclusion of light and heat, and the saline properties of the water, cannot decompose, but must remain precisely in the state in which it is deposited, for ages and ages.

*** PERSONS who write to us, expecting replies through this column, and those who may desire to make contributions to it of brief interesting facts, must always observe the strict rule, viz., to furnish their names, otherwise we cannot place confidence in their communications.

J. F. M., of Mass.—We cannot give a reason satisfactory to ourselves for the phenomena you speak of.

C. D. N., of N. H.—We do not know where cotton thread spools are made.

C. N., of Pa.—Yes, it is true that there was a patent granted in Europe, many years ago, for a revolving retort, which could be used with entire freedom in this country in the distillation of coal oil. Remit $5, and we will send you a copy of the drawing and specification of said patent.

G. W. J., of Miss.—You can unite copper joints with tinsmiths' solder, but the solder of coppersmiths is made of six parts brass, one of zinc, and one of tin. The soldering of copper is a process similar to that of tin. The reason why railroad bars sometimes become magnetic is involved in obscurity. Some believe that the rolling of the cars is the cause of it, others that the magnetic currents of the earth polarize the rails.

J. S. S., of Ga.—So far as we know sumac is not cultivated for tanning purposes in any part of our country. Catechu, alum and salt, fern leaves, willow bark and blackberry bark and stems have been used as substitutes for oak bark.

J. S. H., of Pa.—There is no substance known to us which can be usefully applied for mixing with tallow to make candles burn brighter. Resin and other substances have been mixed with the tallow of candles, but without effecting a special improvement.

J. D. F., of Ohio.—The preparation employed in preserving specimens of natural history is arseniated soap. It must be applied very cautiously. Arsenic mixed with dry pipe clay is also rubbed in at the root of the feathers. In skinning birds a steady hand and a sharp knife are the most important requisites. Stuff with sawdust and tow, using copper wires for the neck, body and legs to give them stiffness and position.

W. M. L., of N. Y.—In reference to melting and refining gold we would advise you to inquire of E. N. Kent, at the United States Assay Office, in Wall street. He is fully competent to give any advice on this subject.

C. S., of N. Y.—By steeping plaster of Paris in a strong solution of alum for two hours, then drying it, and afterwards grinding to powder, it makes a hard and strong cement when mixed with water capable of taking a high polish, and is superior to stucco for many purposes. Gutta percha heated and mixed with plaster of Paris, or carbonate of lime, makes a good molding cement for ornamental work.

D. W., of N. Y.—It is not a question of so much importance to construct canal and river boats on the life-boat principle, as it is to construct sea and lake steamers on this principle. There is not the least necessity for using four wheels for your boat; a single screw will answer every purpose, and thus save considerable expense. The boat which you propose is novel in some respects, but you cannot obtain results from it commensurate with the extra expense of its construction.

R. F. B., of R. I.—We do not believe that you can apply the lifting power of hollow cylinders, economically, in propelling a vessel. We witnessed a steamboat built with its hull upon air-tight cylinders to give it buoyancy, but the arrangement was fatal to its speed, and, besides, it was totally unmanageable,

J. C., of N. H.—In changing your fly-wheel from the fast to the slow shaft, you must make it sufficiently large to have a circumferential velocity equal to what the wheel had on the fast shaft.

R. L. S., of N. Y.—Skins are colored so as to resemble bronze, with a strong solution of logwood, red sanders and alum. Take one pound each of logwood and sanders, boil them in a gallon of water for one hour, then add an ounce of alum. The clear liquor colors the skins; apply it with a sponge.

COTTON SCREW—We have received a letter describing a cotton screw, which cannot be answered, as the writer has omitted his name and Post-office address. He seems to be in a great hurry to get his case into the Patent Office. Let us have a fair chance, friend, and we are ready.

J. M. H., of Ill.—Tinware is japanned with colored copal varnish, put on in successive coats, and then baked in an oven until the varnish becomes perfectly dry and hard.

W. H., of Maine—The sample of mineral you send us for examination is pure silica, or sand. It can be used for making mortar, or by boiling under pressure with an alkali, as potash or soda, the soluble silicate of those bases may be made from it. The value entirely depends on the necessities of the locality.

D. B. Tiffany, of Xenia, Ohio, wishes to correspond with some one engaged in making woodenware of oval shape.

M. S., of Mass.—We do not know where you can get such a machine as you want. Address W. H. Van Gieson, Newark, N. J.

H. B., Jr., of C. W.—For such information as you want respecting wire gages, you had better address Brown & Sharp, Providence, R. I.

W. M., of Ohio—We thank you for the fine list of names you send us. In reference to the Young patent, it does not cover the broad ground of making oil from coal. It must necessarily relate to some peculiar apparatus or process for making oil.

S. T. W., of Canada, asks an answer to the following:—"A posseses an invention in a foreign country. A is a natural-born citizen of the United States, but

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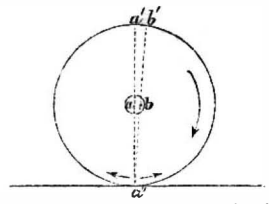
has taken the oath of allegiance in Canada. Can A secure a patent in the United States on the same conditions as a resident of the United States? Can A transfer to B (a resident of the United States) his invention, and B secure a patent in B's name?" If our correspondent has access to Vol. XIII., Sci. Am., (page 16,) he will find an opinion on this subject from the Attorney General. We will state, however, that in the case referred to, the applicant would have to pay a fee of $500, as he would not be considered a citizen of the United States.

S. T. W., of Canada—You may be correct in your idea that there would be more danger in the use of a car coupling that would not permit of being uncoupled in case one of the cars should be thrown from the track. We would like your views and arguments on this question.

H. H., of Conn.—You inquire, "Why does the top of a carriage wheel go faster than the bottom?" By the aid of the accompanying diagram we will explain. The bottom of a carriage wheel not only goes slower than the top, but actually remains stationary for a short space of time. By moving the center of a wheel from a to b, the point a', which was originally directly over



a, comes to b', while the point a'' remains stationary, if the distance $a\ b$ be sufficiently small. At the same time the different points of the circumference of the wheel retain their relative position towards each other and to the axle, i. e., the wheel rotates, but the point, a', moves onward with the axle, and rotates round it, so that it travels over a space twice as great as the center, while the motion of the point a'' in the direction of one arrow is exactly compensated by its rotating motion in the other, so that it remains stationary.

Money received at the Scientific American Office on account of Patent Office business, for the week ending Saturday, December 18, 1858:—

J. H. F., of N. Y., $250; L. S. C., of N. Y., $57; J. S. S., of N. Y., $30; O. D., of Md., $30; R. C., of ——. $10; W. W. H., of L. I., $30; D. W., of Mass., $25; J. W. & A. H. H., of Conn., $25; J. F. S., of N. Y., $55; J. S., of Conn., $15; E. M. W., of Pa., $25; A. J., of Mo., $100; S. S. B., of R. I., $35; J. S. O., of N. Y., $30; S. W., Jr., of N. Y., $36; G. C., of N. Y., $30; H. A. D., of Pa., $25; A. M. O., of Conn., $55; G. F. G., of Mich., $25; F. P. P., of Conn., $30, H. M., of Ky., $25; J. M. C., of N. J., $30; L. F. G., of Conn., $30; I. T. T., of Tenn., $20; F. C. T., of Conn., $30; S. B., of N. J., $25; E. E. M., of N. Y., $30: E. B. W., of Ill., $35; J. W. B., of Ill., $30; U. F., of N. Y., $30; L. F. M, of N. Y., $35; E. H. W., of La., $30; C. O. F, of Maine, $25; J. R., of Conn, $30; J. E., of Conn., $30; T. K. W., of Conn., $30; S. B. & J. M F., of Ill., $25; H. & H., of Mass., $25; D. & R., of Ohio, $30; N. E. H., of N. H., $30.

Specifications and drawings belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, Dec. 18, 1858:—

J. E. H., of Ohio; H. A. D., of Pa.; G. F. G., of Mich.; H. & H., of Mass.; J. G. S., of N. Y.; J. F. S, of N. Y.; L. S. C., of N. Y.; L. F. M., of N. Y.; S. B. & J. M. F., of Ill.; D. W., of Mass.; E. M. W., of Pa.; G. B., of Pa.; R. & McC., of N. Y.; C. O. F., of Me.; J. W. & A. H. H., of Conn.; S. B., of N. J.

A WORD TO OUR PATRONS.

Receipts—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona fide* acknowledgment of the receipt of their funds. The Post Office law does not allow publishers to enclose receipts in the paper.

Will our Friends Favor Us?—Any of our readers who do not preserve files of our paper for binding (we hope there are but few such), and who have Nos. 4 and 5 of the present volume which they are willing to spare, will oblige the publishers by sending said numbers to this office. Ten cents for each copy will be paid.

Back Numbers of the present volume of the Scientific American will be supplied to new subscribers when desired, with the exception of Nos. 4 and 5.

Literary Notices.

Bryant & Stratton's American Merchant—December, 1858—New York: 18 Cooper Institute.—This magazine is full of interesting matter on subjects appertaining to commerce, &c. In this number there is a very valuable article on the Nicobar Islands, showing their position and advantages as a place of call upon the "world's highway."

American Homœpathic Review. Edited by R. G. Perkins, M. D., and Henry M. Smith, published by J. T. Smith & Co., 434 Broadway, and 105 Fourth avenue, New York.—This new medical monthly, the third number of which is now before us, is intended to be the organ of the physicians of the Hahnemann school in this country. It is ably edited and contains much information which will prove interesting to the lay as well as professional homœopathists, all of whom, we presume, wish to be well posted in the progress of their favorite theory.

The Municipalist—G. Savage, 116 Nassau street, New York.—This is a political library condensed in one volume, and arranged as a series of letters. It treats of our social and political polity, and is the most readable book on such subjects we have seen, and is of especial interest to mechanics and agriculturists who really bear the brunt of political struggles, and suffer from bad policy in any department of the government.

London Quarterly Review—L. Scott & Co., New York.—The October contains the following articles, all of which are very interesting:—"Publications of the Arundel Society," "Horace and his Translators," "Wiseman's Last Four Popes," "James Watt," "The Roman at his Farm," "Sir Charles Napier," "The Present and Past Administration." This Review is one of the ablest and most reliable of British republications.

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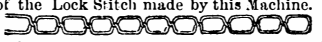

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Science and Art.

Notes on the Progress of the Paddle and Screw.—No. 6.

In Shorter's plan (1800) the shaft had a universal joint, which allowed the propeller to be raised; Pumphrey (1829) detached the propeller at this joint; Taylor (1838) disconnected the shaft by drawing inwards the engine part, so that the propeller could be raised in vertical guides; Maudslay (1846) used a similar plan, and screwed one part of the shaft into the other, to connect them again; Galloway (1843) and Griffiths (1853) disconnected the whole apparatus by chains, which extricated the shaft from the bearings successively; Seaward (1846) lifted the propeller by rods which were screwed into the boss. Wimshurst (1850) used a similar plan, and disconnected the parts by withdrawing bolts; Wilson (1852) caused the propeller to be hoisted by screwing itself along the inclined shaft; Oxley (1845) enclosed the space occupied by the propeller (when at rest vertically) with water-tight doors, in a chamber kept dry by compressed air. The propeller was raised in a different manner by Perkins (1845) and Tucker (I850), who put it on an arm turning vertically round a horizontal pin above the shaft.

Some other inventions relating to the propeller shaft may be briefly noticed. Thus Buchanan (1846) supported the shafts on springs. Montgomery (1846) and Hunt (1854) made it yield to a twisting strain. Wimshurst (1850) and Prideaux (1853) inserted a dynamometer between its parts. Blaxland (1840) put a shaft on a single spherical bearing, so that its inner end could be raised.

Various plans were suggested for receiving the horizontal thrust of the shaft. Hays (1844), Buchanan (1846), and Prideaux (1853), received the end of the shaft in a water box; Penn (1845) upon a steel plate, revolving so as to present new surfaces to the point; Beale (1848) deflected part of the thrust along other transverse shafts by beveled wheels. A common groove and furrow bearing is used in the *Leviathan*. Penn (1854) put wood to work on metal for the bearings under water; Buchanan (1854) placed two shafts one above the other, and the propeller could be attached to either as the vessel was loaded; Napier (1856) worked the propeller shaft at different elevations by an adjusting vertical shaft and cog wheels; James (1857) pumped water through it, to be discharged at the ends of the blades, and thus to turn them.

To regulate the speed of the shaft, Galloway (1843) had a multiplying gear of bands and wheels. Maudslay (1843) used drums and an endless rope. Hays (1844) inserted an additional shaft and cog wheels, while Griffiths (1849) applied the sun and planet motion. Robertson (1856) used grooved friction wheels, and Struthers (1886) geared one shaft to the other by a cog wheel with internal teeth. Bodmer (1844) caused the propeller to turn with a velocity alternately increasing and decreasing. Hunt (1854) connected the shaft with the throttle valve, so that the steam was regulated by the degree of pitch of the blades; Roberts (1851) made the boss much larger than usual; and Griffiths (1849) tapered its after end to a conoidal point, and other forms of the boss were applied in connection with movable blades.

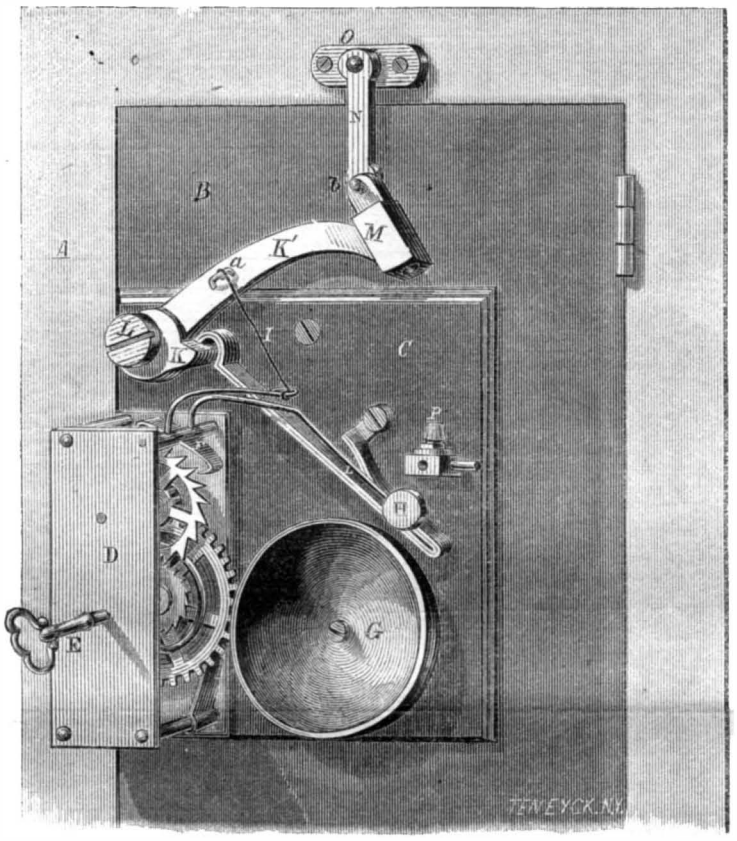
The forms proposed for propeller blades, both for outline and section, are innumerable. It is hoped that in noticing only a few, no injustice will be done to the other twists and curves and fanciful forms, so many of which remain unknown to fame.

We shall direct our attention first to blades not movable on the shaft. In 1825, Marestier had a screw of a "helicoidal surface." Woodcroft (1832) patented a propeller with an increasing pitch. Smith (1836) used two threads of a half turn each at the ends of a diameter. A right-angled triangle, wound upon a cylinder, traces a screw by its hypothenuse. When a spiral curve is put instead of the hypothenuse, the screw will have an increasing pitch. Fraissinet (1838) used a parabolic curve, and Rennie (1839) applied another curve. Beadon (1845) and Templeton (1846) made the blades of a volute form. Rosenberg (1845) reversed the usual curvature, by making the blade near the boss parallel to the shaft.

In the plans of Lowe (1838) and Borrie (1843) each blade revolves in a different plane. Haddan (1839) fixed two spirals at a distance from the shaft; Poole (1848) patented the "Bommereng" propeller, in which a bent blade turns about its center of gravity in the shaft; Joest (1841) shortened every alternate blade; Dundonald (1843) bent them towards the stern; Griffiths (1849) towards the bow, or alternately each way.

Samuda (1843) put the blades projecting inwards from a hollow drum. The surface they presented was made elastic in the plans of Duncan (1816), Macintosh (1847), Hendryckx (1850), and Hunt (1854). Oxley (1845) made it expansible by wedge pieces. Amongst other forms were Sunderland's (1843), and Southworth's (1856), bounded by areas of circles; Griffiths' (1849) open in the center, or with blades like lancets, and Lowe's (1852) with an indescribable twist. Griffiths (1849) proposed to determine the best form of curved blade by using balls floating in the wake of the propeller, so as to indicate the forces acting at different points by spring balances.

THE LITTLE WATCHMAN.



The numerous burglaries which continually take place in all parts of the country suggest the necessity for some reliable means of alarm, simple and efficient, which can be attached to doors or windows, and arouse the occupant of a chamber, before any depredation can be committed by a person entering at an unseemly hour, such an invention is "The Little Watchman," invented by H. R. Robbins, of Baltimore, Md., and a perspective view of which forms the accompanying illustration. It is applied to a door, or can be connected by wires and cranks to windows and distant entrances like a bell.

A is the frame of a door, on the top of which frame is placed a pin, O. To the door, B, is secured the plate C, that has attached to it the simple clockwork, D, wound up by the key, E; the verge and detent, F, has secured to it a small hammer, H, and a piece connected by the wire, I, to the hook, *a*, on the handle, K′, that carries another hammer, M. This handle, K′, is pivoted by a screw, L, to the plate, C, and can move freely upon it; a portion of the handle, K, is extended into the form of a little step, and on this bears one end of the spring, L, the other end of which is secured to the plate, C. A link, N, is attached by a pivot, *b*, to the cap-exploding hammer, M, to hold it in the position shown in our illustration when set. A cap nipple, P, is also secured to the plate, C, and a bell, G, is attached to the same plate.

The operation is as follows, and is very simple:—The door being closed, and the cap-exploding hammer being held raised by passing the hole in N over the pin, O, a cap being placed on P and the clock or alarm movement wound up—the wheel being locked by the detent, F, being raised by the wire, I, the hammer, H, is kept motionless. Should any one, however, attempt to force open the door, the link, N, will be released from O, and the spring, L, will bring down the cap-exploding hammer and explode the cap; thus waking the occupant, and at the same time the alarm movement will be released, and the hammer, H, will keep up a continuous tintinabulation on the bell, so that thorough wakefulness must be the result. Every one who has been startled from his sleep by a mere noise knows how easily and quickly he again falls into the "arms of Morpheus," but should the noise, as in this case, be continued, it is impossible to remain drowsy. The cap hammer may be held up by a pin when the door is opened in the morning, so that a cap will not have to be exploded every morning, but the same may remain on until exploded by a burglar.

This cheap and very perfect contrivance was patented Oct. 19, 1858, and any further particulars can be obtained by addressing Robbins & Co., 46 and 48 Light street, Baltimore, Md.

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Collodion as a photographic coating is exceedingly sensitive, and is well adapted for taking pictures quickly from life. An albumen coating presents more soft and beautiful tints than collodion, but is not so sensitive, yet for copying pictures of statues and such objects on glass, it is the best agent that can be employed. The following method of practising the albumen process in photography is described by Sir David Brewster, in the *North British Review*. He states that very large and extremely beautiful pictures have been taken in the manner he describes. Take the white of several eggs and add eighteen drops of the saturated iodide of potassium for each, then beat them up into a large mass of froth and allow them to stand for ten hours until they fall into a perfect liquid state. Now pour this liquid upon the surface of a clean glass plate, which should be revolved before a moderate fire until a perfect film of the albumen is spread over it. The plate is now dipped into a solution of the nitrate of silver, in strength 70 grains to the ounce of water, and twenty per cent of strong acetic acid added. When taken out of this solution, it is washed in clean water, and before being perfectly dry is placed in the camera and the picture taken. About six minutes is required to take the image, the glass is now taken out and the figure developed by pouring a saturated solution of gallic acid on the albumen, and spreading it evenly with a piece of wool. The picture comes out slowly and of a reddish color at first, but when a solution of silver and gallic acid is applied it assumes a darker and more vivid appearance. It is now fixed with a solution of the hyposulphite of soda, washed with soft water, and comes out beautiful.

Salt for Horses' Feet.

Common salt absorbs moisture from the atmosphere, hence it has been in some instances applied with great success for keeping the hard-bound hoofs of horses moist. The hoofs of some horses become dry and oftentimes crack, thereby rendering them lame, if the animals are driven on hard roads. By bathing the hoof and fetlock joint with a salt brine three times a day, lameness from the above cause will be avoided. It is a common practice with some blacksmiths to rasp cracked hoofs in order to render them more tough, but salt brine is far superior to rasping for effecting this object.

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